CHAPTER 28

LIST OF EFFECTIVE TEMPORARY REVISIONS

FOLLOWING IS A COMPLETE LISTING OF ALL ACTIVE TEMPORARY REVISIONS (TR'S). TR'S NOT LISTED SHOULD BE REMOVED. THE ATA NUMBER, CONFIG CODE AND PAGE NUMBER IDENTIFIES THE PAGE PRECEDING THE TR.

TR NUMBER	ATA NUMBER	CONFIG CODE	PAGE NUMBER	TR DATE

NONE

CHAPTER 28

FUEL SYSTEM

LIST OF EFFECTIVE PAGES

CHAPTER/ SECTION	PAGE	DATE	CONFIG CODE
List of Effective Pages	1	Dec 15/95	
	2	Dec 15/95	
	3	Dec 15/95	
	4	Dec 15/95	
	5	Dec 15/95	
	6	Dec 15/95	
	7	Dec 15/95	
	8	Dec 15/95	
	9	Dec 15/95	
	10	Dec 15/95	
	11	Dec 15/95	
	12	Dec 15/95	
Table of Contents	1	May 15/87	
	2	May 15/89	
	3	May 15/89	
	4	May 15/89	
	5	Dec 15/93	
	6	May 15/89	
	7	May 15/89	
	8	May 15/89	
	9	Dec 15/93	
	10	May 15/89	
	11	May 15/89	
	12	May 15/89	
	13	May 15/89	
	14	May 15/89	
	15	May 15/89	
	16	May 15/89	
28-conts	1	Nov 15/87	
28-conts	2	Jun 15/93	
28-conts	3	Dec 15/92	
28-conts	4	Mar 15/91	
28-conts	5	Nov 15/83	
28-conts	6	Dec 15/91	
28-conts	7	May 15/82	
28-conts	8	Aug 15/82	
28-DIAGM	1	Nov 15/89	
28-DIAGM	2	Aug 15/82	
28-DIAGM	3	Aug 15/82	
28-DIAGM	4	May 15/82	
28-DIAGM	5	May 15/82	
28-DIAGM	6	Aug 15/82	
28-DIAGM	7	Aug 15/82	
28-DIAGM	8	Nov 15/82	
28-DIAGM	9	Aug 15/82	
28-DIAGM	10	Aug 15/82	
28-DIAGM	11	Aug 15/82	
28-DIAGM	12	Aug 15/82	
28-DIAGM	13	Aug 15/82	
28-DIAGM	14	Nov 15/89	
28-INDEX	1	Dec 15/93	
28-INDEX	2	Dec 15/93	
28-INDEX	3	Jun 15/92	
28-INDEX	4	Jun 15/92	
28-INDEX	5	Nov 15/89	
28-INDEX	6	Nov 15/89	
28-INDEX	7	Nov 15/89	
28-INDEX	8	Nov 15/89	
28-INDEX	9	Nov 15/89	
28-INDEX	10	Nov 15/89	
28-INDEX	11	Nov 15/89	
28-INDEX	12	Nov 15/89	
28-INDEX	13	Nov 15/89	
28-INDEX	14	Nov 15/89	
28-INDEX	15	Nov 15/89	
28-INDEX	16	Nov 15/89	
28-INDEX	17	Nov 15/89	
28-INDEX	18	Nov 15/89	
28-INDEX	19	Nov 15/89	
28-INDEX	20	Nov 15/89	
28-INDEX	21	Nov 15/89	
28-INDEX	22	Nov 15/89	
28-00-00	1	Jun 15/79	1
28-00-00	2	Nov 15/84	1
28-00-00	3/4	Nov 15/83	1
28-00-00	5/6	Jun 15/94	1
28-00-00	7/8	Jun 15/94	1
28-00-00	9/10	Aug 15/81	1
28-00-00	11/12	Aug 15/81	1
28-00-00	13/14	Aug 15/81	1
28-00-00	15/16	Aug 15/81	1
28-00-00	1	May 15/82	2

CHAPTER/ SECTION	PAGE	DATE	CONFIG CODE
28-00-00	2	Nov 15/82	2
28-00-00	3/4	Nov 15/82	2
28-00-00	5/6	Nov 15/82	2
28-00-00	7/8	Nov 15/82	2
28-00-00	9/10	Nov 15/82	2
28-00-00	11/12	Nov 15/82	2
28-00-00	13/14	Nov 15/82	2
28-00-00	15/16	Jun 15/94	2
28-00-00	17/18	Jun 15/94	2
28-00-10	401	Jun 15/79	
28-00-10	402	Jun 15/79	
28-10-00	1	Nov 15/83	
28-10-00	2	May 15/82	
28-10-00	3/4	May 15/82	
28-11-00	1	Dec 15/79	1
28-11-00	2	Mar 15/80	1
28-11-00	3	May 15/85	1
28-11-00	4	Nov 15/81	1
28-11-00	5/6	Dec 15/79	1
28-11-00	7	Nov 15/81	1
28-11-00	8	Dec 15/79	1
28-11-00	9	Dec 15/79	1
28-11-00	10	Dec 15/79	1
28-11-00	11	Nov 15/81	1
28-11-00	12	Dec 15/79	1
28-11-00	13/14	Aug 15/81	1
28-11-00	15/16	Dec 15/79	1
28-11-00	17	Dec 15/79	1
28-11-00	18	Dec 15/79	1
28-11-00	1	May 15/82	2
28-11-00	2	May 15/82	2
28-11-00	3	Nov 15/83	2
28-11-00	4	Nov 15/83	2
28-11-00	5/6	May 15/82	2
28-11-00	7	May 15/82	2
28-11-00	8	May 15/82	2
28-11-00	9	May 15/82	2
28-11-00	10	May 15/82	2
28-11-00	11	May 15/82	2
28-11-00	12	Nov 15/83	2
28-11-00	13	Nov 15/83	2
28-11-00	14	May 15/82	2
28-11-00	15/16	May 15/82	2
28-11-00	17/18	May 15/82	2
28-11-00	19	May 15/82	2
28-11-00	20	May 15/82	2
28-11-00	21/22	May 15/82	2
28-11-00	23	Nov 15/83	2
28-11-00	24	Nov 15/83	2
28-11-00	101	Mar 15/81	1
28-11-00	102	Jun 15/94	1
28-11-00	103/104	Aug 15/81	1
28-11-00	105/106	Mar 15/81	1
28-11-00	107/108	Mar 15/81	1
28-11-00	109	Mar 15/81	1
28-11-00	110	Mar 15/81	1
28-11-00	111/112	Nov 15/83	1
28-11-00	101	May 15/82	2
28-11-00	102	Jun 15/94	2
28-11-00	103/104	May 15/82	2
28-11-00	105/106	May 15/82	2
28-11-00	107/108	May 15/82	2
28-11-00	109	May 15/82	2
28-11-00	110	May 15/82	2
28-11-00	111	May 15/82	2
28-11-00	112	May 15/82	2
28-11-00	113	May 15/82	2
28-11-00	114	May 15/82	2
28-11-00	115	May 15/82	2
28-11-00	116	Nov 15/83	2
28-11-00	117/118	Jul 15/84	2
28-11-00	201	May 15/82	
28-11-00	202	Mar 15/83	
28-11-00	203	May 15/82	
28-11-00	204	May 15/85	
28-11-00	205	Jul 15/84	
28-11-00	206	Jul 15/84	
28-11-00	207	Jul 15/84	
28-11-00	208	May 15/82	
28-11-00	209	Nov 15/85	
28-11-00	210	Nov 15/85	
28-11-00	211	May 15/82	
28-11-00	212	May 15/82	
28-11-00	213	May 15/82	
28-11-00	214	May 15/82	
28-11-00	215	Jul 15/84	
28-11-00	216	Jul 15/84	
28-11-00	217	Jul 15/84	
28-11-00	218	Jul 15/84	
28-11-00	501	May 15/82	
28-11-00	502	May 15/88	
28-11-00	503/504	May 15/88	
28-11-00	601	Mar 15/80	
28-11-00	602	Nov 15/85	
28-11-00	603	Mar 15/80	
28-11-00	604	May 15/78	

CHAPTER/ SECTION	PAGE	DATE	CONFIG CODE
28-11-00	605/606	May 15/87	
28-11-00	801	Mar 15/80	
28-11-00	802	May 15/87	
28-11-00	803	May 15/82	
28-11-00	804	Aug 15/77	
28-11-00	805/806	May 15/77	
28-11-00	807	Aug 15/77	
28-11-00	808	Mar 15/80	
28-11-00	809	May 15/82	
28-11-00	810	May 15/77	
28-11-00	811	May 15/87	
28-11-00	812	May 15/87	
28-11-01	401	Feb 15/78	
28-11-01	402	Feb 15/78	
28-11-01	403/404	Aug 15/78	
28-11-02	401	Aug 15/81	
28-11-02	402	May 15/75	
28-11-02	403/404	Nov 15/73	
28-11-05	401	Aug 15/81	
28-11-05	402	May 15/78	
28-11-05	403/404	Nov 15/76	
28-11-08	201/202	May 15/82	
28-11-08	401	May 15/82	
28-11-08	402	May 15/82	
28-11-08	403	May 15/82	
28-11-08	404	May 15/82	
28-11-08	405	May 15/82	
28-11-08	406	May 15/82	
28-11-09	401	Jun 15/80	
28-11-09	402	Aug 15/78	
28-11-09	403	Jun 15/80	
28-11-09	404	Aug 15/78	
28-11-10	401	Aug 15/78	
28-11-10	402	Aug 15/78	
28-11-10	403	Aug 15/78	
28-11-10	404	Aug 15/78	
28-11-11	401	May 15/82	
28-11-11	402	May 15/82	
28-11-11	403	May 15/88	
28-11-11	404	May 15/82	
28-11-12	401	Dec 15/92	
28-11-12	402	Dec 15/92	
28-11-12	403	Dec 15/92	
28-11-12	404	Dec 15/92	
28-11-12	701	Dec 15/92	
28-11-12	702	Dec 15/92	
28-11-12	703/704	Dec 15/92	
28-11-13	401	Dec 15/92	
28-11-13	402	Dec 15/92	
28-11-13	403	Dec 15/92	
28-11-13	404	May 15/82	
28-11-14	401	May 15/82	
28-11-14	402	May 15/82	
28-11-14	403	May 15/82	
28-11-14	404	May 15/82	
28-11-14	405	May 15/82	
28-11-14	406	May 15/82	
28-11-15	401	Aug 15/81	
28-11-15	402	Aug 15/81	
28-11-15	403	Aug 15/81	
28-11-15	404	Jul 15/83	
28-11-15	405	Jul 15/83	
28-11-15	406	Aug 15/81	
28-12-00	1	Dec 15/79	
R 28-12-00	2	Dec 15/95	
28-12-01	401	Feb 15/78	
R 28-12-01	402	Dec 15/95	
28-12-02	401/402	Mar 1/72	
28-13-00	1	Aug 15/81	
28-13-00	2	Aug 15/81	
28-13-00	3/4	Aug 15/81	
28-13-00	5/6	May 15/82	
28-13-00	7/8	Nov 15/81	
28-13-01	401	May 15/78	
28-13-01	402	May 15/78	
28-13-01	403	Nov 15/78	
28-13-01	404	Jul 15/84	
28-13-01	601	Sep 15/79	
28-13-01	602	Sep 15/79	
28-13-02	401	Aug 15/78	
28-13-02	402	Jul 15/84	
28-13-03	401	Sep 15/80	
28-13-03	402	Feb 15/75	
28-13-04	401	Feb 15/75	
28-13-04	402	Feb 15/75	
28-13-06	401	Feb 15/75	
28-13-06	402	Mar 1/72	
28-13-07	401	Jul 15/84	
28-13-07	402	Jul 15/84	
28-13-07	403/404	Mar 1/72	
28-20-00	1	Nov 15/84	
28-20-00	2	May 15/82	
R 28-20-00	201	Dec 15/95	
28-20-00	202	May 15/89	
28-20-01	201	Nov 15/81	
28-20-01	202	May 15/75	

CHAPTER/ SECTION	PAGE	DATE	CONFIG CODE
28-20-01	203	May 15/75	
28-20-01	204	May 15/75	
28-20-01	205	Nov 15/81	
28-20-01	206	Aug 1/72	
28-20-01	207	Jul 15/84	
28-20-01	208	May 15/86	
28-21-00	1	Dec 15/80	1
28-21-00	2	May 15/78	1
28-21-00	3	May 15/78	1
28-21-00	4	May 15/78	1
28-21-00	5/6	Feb 15/79	1
28-21-00	7	Jul 15/84	1
28-21-00	8	Jul 15/83	1
28-21-00	9/10	May 15/78	1
28-21-00	11	Nov 15/81	1
28-21-00	12	Feb 15/79	1
28-21-00	13	Feb 15/79	1
28-21-00	14	Feb 15/79	1
28-21-00	15	Nov 15/81	1
28-21-00	16	Feb 15/79	1
28-21-00	17	Feb 15/79	1
28-21-00	18	Feb 15/79	1
28-21-00	19	Feb 15/79	1
28-21-00	20	Feb 15/79	1
28-21-00	21	Sep 15/79	1
28-21-00	22	Sep 15/79	1
28-21-00	23/24	Sep 15/79	1
28-21-00	25/26	Dec 15/80	1
28-21-00	27/28	Sep 15/79	1
28-21-00	29	Sep 15/79	1
28-21-00	30	Sep 15/79	1
28-21-00	31/32	Sep 15/79	1
28-21-00	1	May 15/82	2
28-21-00	2	May 15/82	2
28-21-00	3	May 15/82	2
28-21-00	4	May 15/85	2
28-21-00	5/6	May 15/82	2
28-21-00	7	May 15/82	2
28-21-00	8	May 15/85	2
28-21-00	9/10	May 15/82	2
28-21-00	11	May 15/85	2
28-21-00	12	May 15/82	2
28-21-00	13	May 15/82	2
28-21-00	14	Jul 15/84	2
28-21-00	15	May 15/82	2
28-21-00	16	May 15/82	2
28-21-00	17	May 15/82	2
28-21-00	18	May 15/82	2
28-21-00	19	May 15/82	2
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28-21-00	21	May 15/82	2
28-21-00	22	May 15/82	2
28-21-00	23	May 15/82	2
28-21-00	24	May 15/82	2
28-21-00	25	May 15/85	2
28-21-00	26	May 15/85	2
28-21-00	27/28	Sep 15/80	2
28-21-00	29/30	May 15/82	2
28-21-00	31/32	May 15/82	2
28-21-00	101	Mar 15/81	1
28-21-00	102	Nov 15/83	1
28-21-00	103	Nov 15/87	1
28-21-00	104	Mar 15/81	1
28-21-00	105	Mar 15/81	1
28-21-00	106	Nov 15/81	1
28-21-00	107	Nov 15/81	1
28-21-00	108	Nov 15/87	1
28-21-00	109	Nov 15/87	1
28-21-00	110	Jun 15/93	1
28-21-00	111	Nov 15/83	1
28-21-00	112	Nov 15/82	1
28-21-00	113	May 15/88	1
28-21-00	114	Nov 15/83	1
28-21-00	115/116	Nov 15/82	1
28-21-00	117/118	Nov 15/82	1
28-21-00	119/120	Nov 15/85	1
28-21-00	121/122	Nov 15/85	1
28-21-00	123/124	Nov 15/85	1
28-21-00	125/126	May 15/87	1
28-21-00	127	Nov 15/82	1
28-21-00	128	Nov 15/82	1
28-21-00	101	May 15/82	2
28-21-00	102	Nov 15/83	2
28-21-00	103	May 15/85	2
28-21-00	104	May 15/82	2
28-21-00	105	May 15/82	2
28-21-00	106	May 15/82	2
28-21-00	107	May 15/82	2
28-21-00	108	Nov 15/83	2
28-21-00	109	Nov 15/83	2
28-21-00	110	Nov 15/83	2
28-21-00	111	May 15/82	2
28-21-00	112	Nov 15/83	2
28-21-00	113	May 15/86	2
28-21-00	114	May 15/88	2
28-21-00	115/116	Nov 15/83	2

CHAPTER/ SECTION	PAGE	DATE	CONFIG CODE
28-21-00	117/118	Nov 15/83	2
28-21-00	119/120	Nov 15/85	2
28-21-00	121/122	Nov 15/85	2
28-21-00	123/124	Nov 15/85	2
28-21-00	125/126	Nov 15/85	2
28-21-00	127/128	Nov 15/85	2
28-21-00	129/130	Nov 15/83	2
28-21-00	201	Aug 15/81	
28-21-00	202	Aug 15/81	
28-21-00	203/204	Aug 15/81	
28-21-01	201	May 15/82	
28-21-01	202	May 15/82	
28-21-01	401	Dec 15/79	
28-21-01	402	Dec 15/79	
28-21-01	403	Nov 15/82	
28-21-01	404	Jul 15/84	
28-21-01	405	Jul 15/84	
28-21-01	406	Jul 15/84	
28-21-01	407/408	Aug 15/82	
28-21-03	201/202	Mar 15/81	
28-21-03	401	Aug 15/81	
28-21-03	402	May 15/82	
28-21-03	403	Aug 15/81	
28-21-03	404	Nov 15/81	
28-21-04	401	Aug 15/81	
28-21-04	402	Aug 15/81	
28-21-04	403	Aug 15/81	
28-21-04	404	Nov 15/82	
28-21-05	201	May 15/89	
28-21-05	202	May 15/89	
28-21-07	201/202	May 15/85	
28-21-07	401	May 15/89	
28-21-07	402	May 15/89	
R 28-21-07	403	Dec 15/95	
R 28-21-07	404	Dec 15/95	
R 28-21-07	405	Dec 15/95	
R 28-21-07	406	Dec 15/95	
28-21-07	407	Jun 15/95	
28-21-07	408	Jun 15/95	
28-21-09	401	May 15/82	
28-21-09	402	May 15/82	
28-21-09	403	May 15/82	
28-21-09	404	May 15/82	
28-21-09	405/406	May 15/82	
28-21-10	401	Jun 15/94	
28-21-10	402	Jun 15/94	
28-21-10	403	Jun 15/94	
28-21-10	404	Nov 15/84	

CHAPTER/ SECTION	PAGE	DATE	CONFIG CODE
28-21-11	401	Jun 15/94	
28-21-11	402	Jun 15/94	
28-21-11	403	Jun 15/94	
28-21-11	404	Nov 15/86	
28-21-11	405/406	Nov 15/86	
28-21-12	401	Jul 15/83	
28-21-12	402	Jul 15/83	
28-21-12	403	Jul 15/83	
28-21-12	404	Jul 15/83	
28-21-12	405	Jul 15/83	
28-21-12	406	Jul 15/83	
28-21-99	401/402	Nov 15/75	
28-21-99	501	May 15/88	
28-21-99	502	May 15/88	
28-21-99	503/504	May 15/88	
28-21-99	505/506	Sep 15/80	
28-21-99	507/508	May 15/82	
28-22-00	1	Sep 15/80	
28-22-00	2	Sep 15/80	
28-22-00	3	Aug 15/82	
28-22-00	4	Aug 15/82	
28-22-00	5/6	Feb 15/79	
28-22-00	7/8	May 15/82	
28-22-00	9/10	Feb 15/79	
28-22-00	11/12	May 15/82	
28-22-00	13/14	Feb 15/79	
28-22-00	15/16	May 15/82	
28-22-00	17/18	Feb 15/79	
28-22-00	19/20	May 15/82	
28-22-00	21	Feb 15/79	
28-22-00	22	Feb 15/79	
28-22-00	23/24	Aug 15/82	
28-22-00	101	Mar 15/81	
28-22-00	102	May 15/89	
28-22-00	103	Mar 15/81	
28-22-00	104	May 15/82	
28-22-00	105	Mar 15/84	
28-22-00	106	Mar 15/81	
28-22-00	107/108	Mar 15/81	
28-22-00	109/110	May 15/82	
28-22-00	201	Mar 15/80	1
28-22-00	202	May 15/83	1
28-22-00	203	May 15/88	1
28-22-00	204	May 15/88	1
28-22-00	205	May 15/86	1
28-22-00	206	May 15/88	1
28-22-00	207/208	Jun 15/79	1
28-22-00	209/210	May 15/88	1

CHAPTER/ SECTION	PAGE	DATE	CONFIG CODE
28-22-00	201	May 15/82	2
28-22-00	202	May 15/88	2
28-22-00	203	May 15/88	2
28-22-00	204	May 15/88	2
28-22-00	205	May 15/88	2
28-22-00	206	May 15/88	2
28-22-00	207/208	May 15/82	2
28-22-00	209	May 15/88	2
28-22-00	210	May 15/88	2
28-22-01	201	May 15/89	
28-22-01	202	May 15/89	
28-22-02	401	Mar 15/83	
28-22-02	402	Mar 15/83	
28-22-02	403/404	Mar 15/83	
28-22-04	401	Dec 15/79	
28-22-04	402	Dec 15/79	
28-22-04	403	Dec 15/79	
28-22-04	404	Dec 15/79	
28-22-05	401	Mar 15/80	
28-22-05	402	Dec 15/79	
28-22-05	403/404	May 15/76	
28-23-00	1	Sep 15/79	
28-23-00	2	Mar 15/80	
28-23-00	3	May 15/82	
28-23-00	4	May 15/82	
28-23-00	5	Sep 15/80	
28-23-00	6	May 15/82	
28-23-00	7	Sep 15/80	
28-23-00	8	Sep 15/80	
28-23-00	9	May 15/82	
28-23-00	10	Sep 15/80	
28-23-01	401	Mar 15/80	
28-23-01	402	Sep 15/79	
28-23-01	403	Jan 15/73	
28-23-01	404	Sep 15/79	
28-23-02	401	Sep 15/79	
28-23-02	402	May 15/82	
28-23-02	403	May 15/82	
28-23-02	404	Sep 15/79	
28-23-02	405/406	May 15/82	
28-23-04	401	May 15/82	
28-23-04	402	May 15/82	
28-23-04	403	May 15/82	
28-23-04	404	May 15/82	
28-23-04	405/406	May 15/82	
28-24-00	1	Nov 15/81	
28-24-00	2	Jun 15/94	
28-24-00	3/4	Nov 15/81	
28-24-00	5/6	May 15/82	
28-24-00	7/8	May 15/88	
28-24-00	9/10	May 15/88	
28-24-00	11/12	Nov 15/81	
28-24-00	13/14	Nov 15/81	
28-24-00	15/16	May 15/87	
28-24-00	17	Nov 15/81	
28-24-00	18	May 15/82	
28-24-00	19/20	Nov 15/81	
28-24-00	21/22	May 15/82	
28-24-00	23	Nov 15/81	
28-24-00	24	Nov 15/81	
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28-24-00	118	Aug 15/81	
28-24-00	119	Aug 15/81	
28-24-00	120	Aug 15/81	
28-24-00	121	May 15/88	
28-24-00	122	May 15/88	
28-24-00	123/124	Dec 15/92	
28-24-00	125/126	Dec 15/92	

	CHAPTER/ SECTION	PAGE	DATE	CONFIG CODE
	25-24-00	127/128	Dec 15/92	
	28-24-00	129/130	Dec 15/92	
	28-24-00	131/132	May 15/87	
	28-24-00	133/134	Feb 15/82	
	28-24-00	135/136	May 15/87	
	28-24-00	501	Feb 15/82	
	28-24-00	502	Feb 15/82	
	28-24-00	503	Feb 15/82	
	28-24-00	504	May 15/87	
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	28-24-00	508	Jun 15/94	
	28-24-00	509/510	Jun 15/94	
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R	28-24-00	602	Dec 15/95	
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	28-24-01	407	May 15/88	
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	28-24-01	410	May 15/88	
	28-24-01	411	May 15/88	
	28-24-01	412	May 15/88	
	28-24-01	413	May 15/88	
	28-24-01	414	May 15/88	
	28-24-01	415	May 15/82	
	28-24-01	416	May 15/88	
	28-24-01	417/418	May 15/82	
	28-24-02	201/202	May 15/87	
	28-24-02	401	Jul 15/83	
	28-24-02	402	Nov 15/84	
	28-24-02	403	Nov 15/83	
	28-24-02	404	May 15/87	
	28-24-02	405	May 15/87	
	28-24-02	406	Jul 15/83	
	28-24-03	401	Nov 15/81	
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	28-24-03	403	May 15/88	
	28-24-03	404	Mar 15/80	
	28-24-07	401	Nov 15/84	
	28-24-07	402	May 15/87	
	28-24-07	403	Apr 1/72	
	28-24-07	404	May 15/87	
	28-24-07	501	Sep 15/79	
	28-24-07	502	Aug 15/78	
	28-24-08	201/202	Nov 15/83	
	28-24-08	401	Aug 15/81	
	28-24-08	402	Dec 15/93	
	28-24-08	403	Nov 15/76	
	28-24-08	404	Dec 15/93	
	28-24-09	401/402	Aug 15/78	
	28-24-10	401	Dec 15/93	
	28-24-10	402	Dec 15/93	
	28-24-10	403/404	Dec 15/93	
	28-24-10	405/406	Dec 15/93	
	28-24-10	501/502	Dec 15/92	
	28-24-11	401	Nov 15/81	
	28-24-11	402	Nov 15/88	
	28-24-11	403	Nov 15/88	
	28-24-11	404	Nov 15/76	
	28-24-13	201/202	Mar 15/91	
	28-24-13	401	Mar 15/80	
	28-24-13	402	Mar 15/91	
	28-24-13	403/404	Apr 1/72	
	28-24-14	401	Jun 15/94	
	28-24-14	402	Jun 15/94	
	28-24-14	403	Jun 15/94	
	28-24-14	404	Jun 15/94	
	28-24-14	405/406	Jun 15/94	
	28-24-15	401	Aug 15/81	
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	28-24-15	403	Aug 15/81	
	28-24-15	404	Aug 15/81	
	28-24-15	405	Aug 15/81	
	28-24-15	406	Aug 15/81	
	28-24-17	201/202	May 15/85	
	28-24-19	401	Feb 15/78	
	28-24-19	402	May 15/87	
	28-24-19	403	Aug 15/81	
	28-24-19	404	Aug 15/81	
	28-24-20	201/202	May 15/88	
	28-24-20	401	Jun 15/95	
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	28-24-20	403	Jun 15/95	
	28-24-20	404	Jun 15/95	
	28-24-20	405	Jun 15/95	
	28-24-20	406	Jun 15/95	
	28-24-20	407	Jun 15/95	
	28-24-20	408	Jun 15/95	
	28-24-20	409/410	Feb 15/76	

CHAPTER/ SECTION	PAGE	DATE	CONFIG CODE
28-24-20	411/412	Aug 15/77	
28-24-20	413/414	Aug 15/77	
28-24-20	415	Nov 15/74	
28-24-20	416	Jun 15/95	
28-24-20	417	Jun 15/95	
28-24-20	418	Jun 15/95	
28-24-20	419/420	Jun 15/95	
28-24-20	601/602	May 15/90	
28-24-20	801	May 15/89	
28-24-20	802	Mar 15/91	
28-24-20	803	May 15/89	
28-24-20	804	Mar 15/91	
28-24-20	805	May 15/90	
28-24-20	806	May 15/89	
28-24-20	807/808	May 15/89	
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28-24-28	405	May 15/85	
28-24-28	406	May 15/85	
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28-25-01	405/406	Aug 15/81	
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28-26-00	104	Feb 15/82	
28-26-00	105/106	Aug 15/82	
28-26-00	107/108	Dec 15/92	
28-26-00	501/502	May 15/75	
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28-27-00	117/118	Mar 15/81	2
28-27-00	119/120	May 15/82	2
28-27-00	121/122	Mar 15/81	2
28-27-00	123/124	May 15/82	2
28-27-00	125/126	May 15/82	2
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28-27-00	502	May 15/82	
28-27-00	503	May 15/88	
28-27-00	504	May 15/88	
28-27-00	505	May 15/88	

CHAPTER/ SECTION	PAGE	DATE	CONFIG CODE
28-27-00	506	Jun 15/93	
28-27-00	507	Jun 15/93	
28-27-00	508	May 15/88	
28-27-01	201/202	Dec 15/92	
28-27-01	401	May 15/78	
28-27-01	402	Dec 15/91	
28-27-01	403	Dec 15/91	
28-27-01	404	Dec 15/91	
28-27-02	201/202	May 15/82	
28-27-02	401	May 15/82	
28-27-02	402	May 15/82	
28-27-02	403	May 15/82	
28-27-02	404	Nov 15/83	
28-27-02	405	May 15/82	
28-27-02	406	May 15/82	
28-27-02	407/408	May 15/82	
28-27-04	401	May 15/82	
28-27-04	402	May 15/82	
28-27-04	403	May 15/88	
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28-27-05	402	May 15/82	
28-27-05	403/404	May 15/82	
28-27-06	401	Nov 15/88	
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28-27-07	403/404	May 15/82	
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28-31-00	11	May 15/78	
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28-31-00	123/124	Mar 15/81	
28-31-00	125/126	Mar 15/81	
28-31-00	127/128	May 15/82	
28-31-00	129/130	May 15/82	
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28-31-00	133/134	Mar 15/81	
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28-31-01	403	Aug 1/72	
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28-31-01	405/406	May 15/88	
28-31-02	401	Aug 15/81	
28-31-02	402	Aug 1/72	
28-31-02	403/404	Aug 15/81	
28-31-99	201	Aug 15/81	
28-31-99	202	Aug 15/81	
28-31-99	401	Sep 15/79	
28-31-99	402	Sep 15/79	
28-31-99	403/404	Sep 15/79	

CHAPTER/ SECTION	PAGE	DATE	CONFIG CODE
28-40-00	1	May 15/82	
28-40-00	2	May 15/82	
28-41-00	1	Nov 15/87	
28-41-00	2	May 15/82	
28-41-00	3	Nov 15/87	
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28-41-00	7/8	Aug 15/82	
28-41-00	9/10	Aug 15/82	
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28-41-00	13	Aug 15/81	
28-41-00	14	May 15/82	
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28-41-00	123/124	May 15/82	2
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28-41-00	129/130	Jul 15/83	2
28-41-00	131/132	Dec 15/91	2
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28-41-00	202	May 15/85	
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28-41-00	213	May 15/85	
28-41-00	214	May 15/85	
28-41-00	215	May 15/85	
28-41-00	216	May 15/85	

	CHAPTER/ SECTION	PAGE	DATE	CONFIG CODE
	28-41-00	301/302	Aug 15/81	
	28-41-00	501	Mar 15/81	1
	28-41-00	502	Aug 15/81	1
	28-41-00	503	Nov 15/83	1
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	28-41-17	403/404	Mar 15/83	
	28-41-19	401	May 15/77	
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CHAPTER 28

FUEL SYSTEM

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Tank 2L/2R Low Fuel Level Indicating System Schematic		133/134

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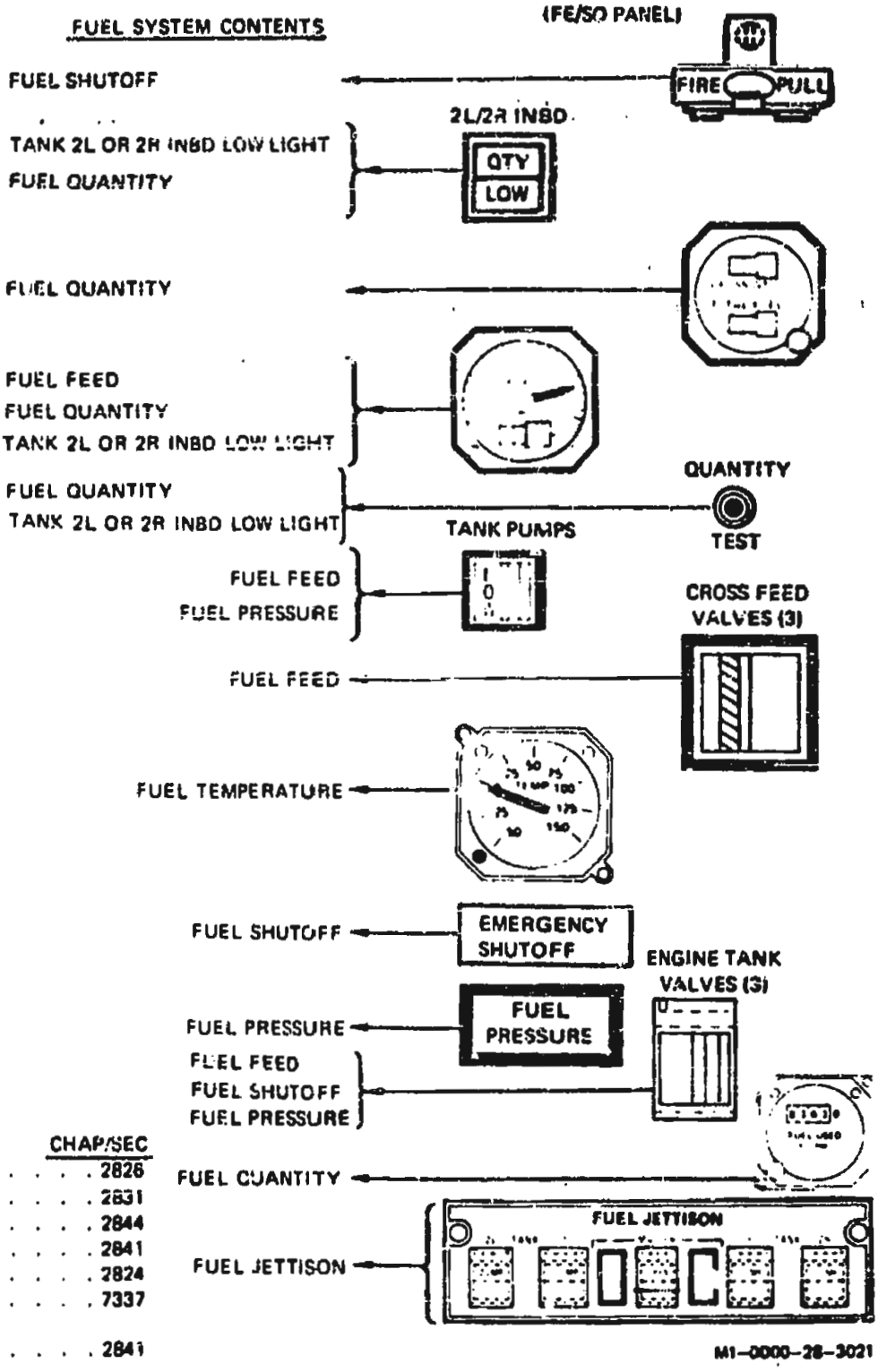

TITLE	CHAP/SEC
FUEL FEED	2826
FUEL JETTISON	2831
FUEL PRESSURE	2844
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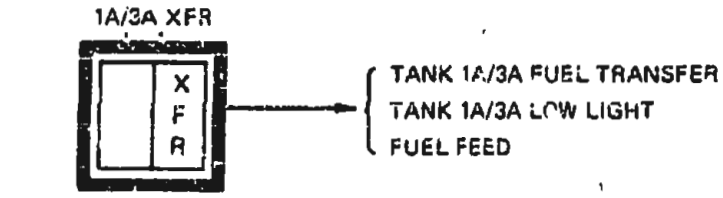
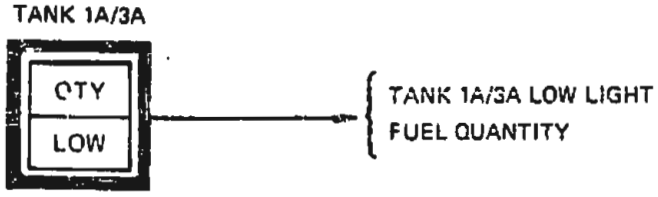
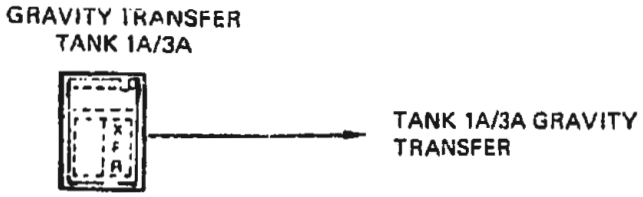
FUEL SHUTOFF	2824
FUEL TEMPERATURE	7337
TANK 2L OR 2R INBD LOW LIGHT	2841

FUEL SYSTEM CONTENTS

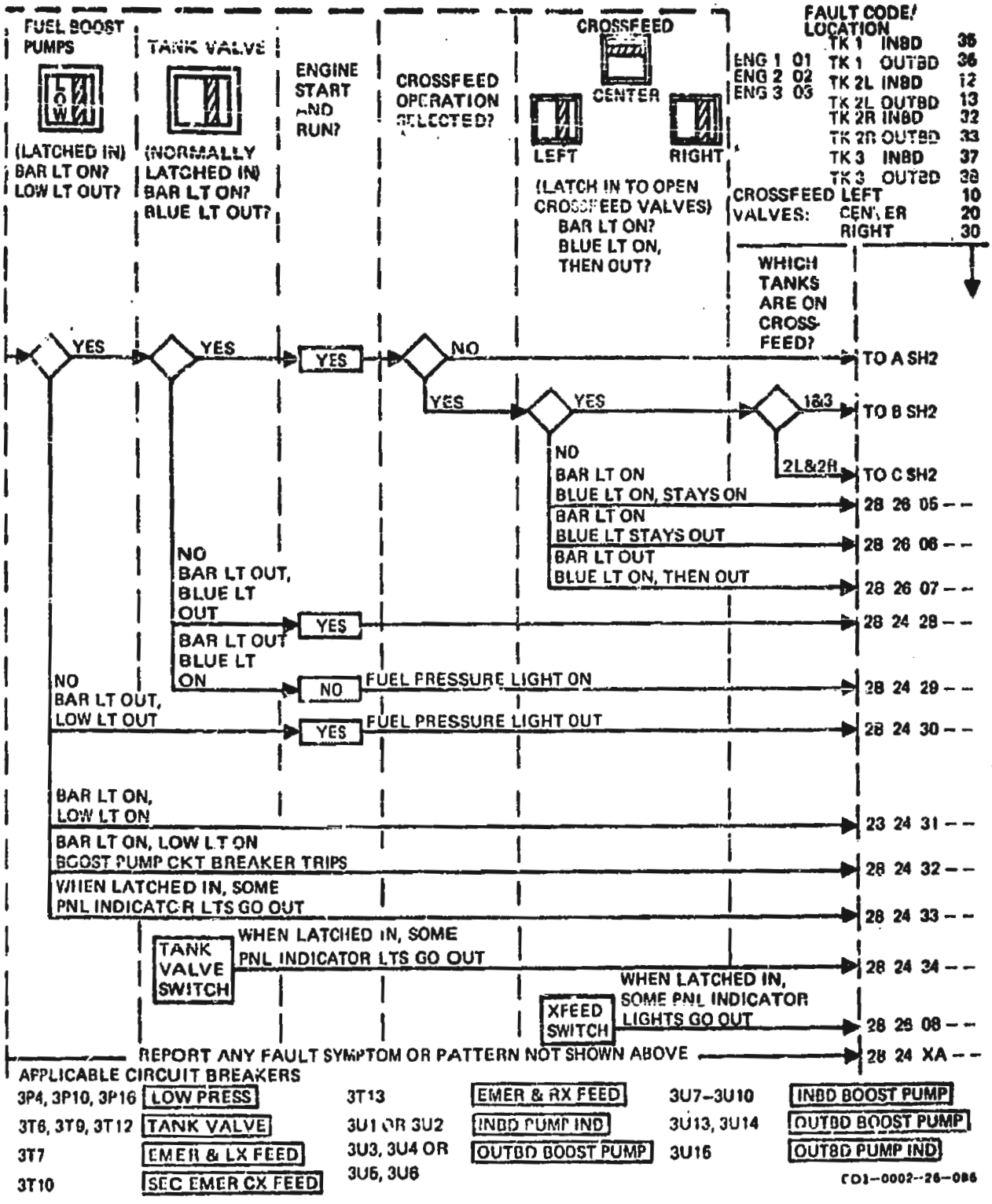






TITLE	CHAP/SEC
FUEL FEED	2826
FUEL QUANTITY	2841
TANK 1A/3A FUEL TRANSFER	2827
TANK 1A/3A GRAVITY TRANSFER	2827
TANK 1A/3A LOW LIGHT	2841

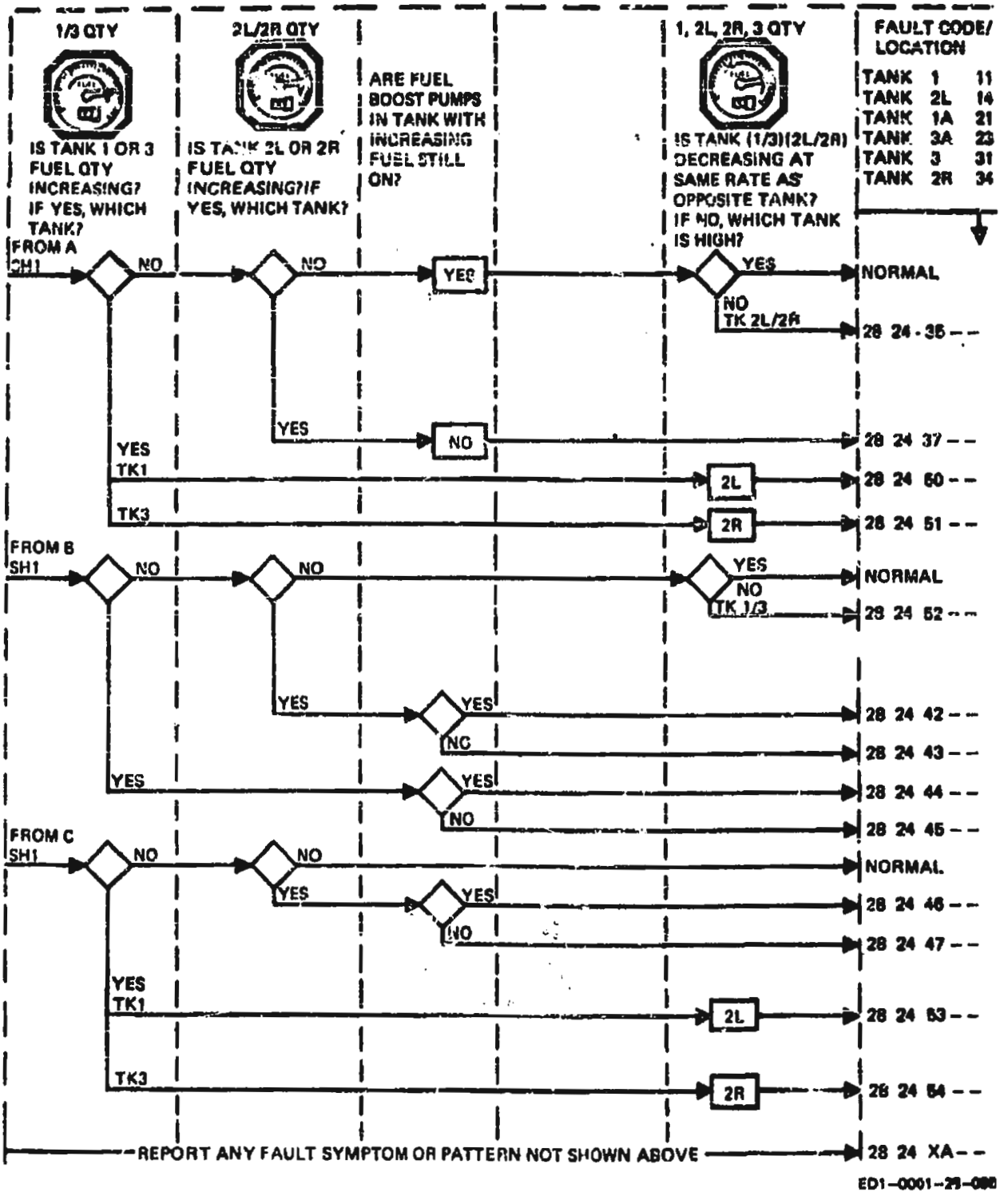
M1-0001-28-3022



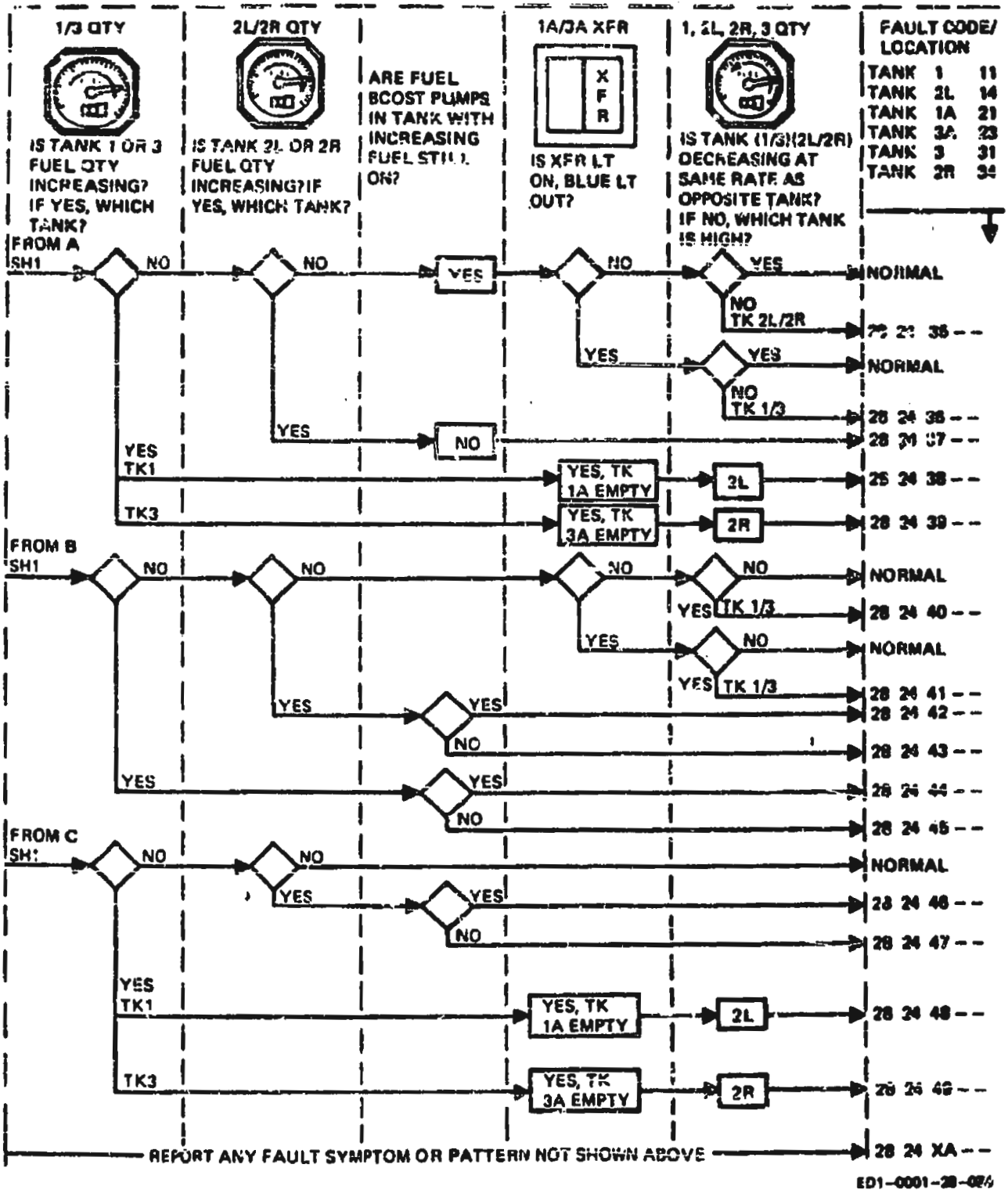
R Fuel Feed (Sheet 1) - Fault Codes
Figure 1

EFFECTIVITY: ALL

28-FAULT CODE DIAGRAM


1/3 QTY
IS TANK 1 OR 3 FUEL QTY INCREASING? IF YES, WHICH TANK?
FROM A SH1
2L/2R QTY
IS TANK 2L OR 2R FUEL QTY INCREASING? IF YES, WHICH TANK?
ARE FUEL BOOST PUMPS IN TANK WITH INCREASING FUEL STILL ON?
1, 2L, 2R, 3 QTY
IS TANK (1/3)(2L/2R) DECREASING AT SAME RATE AS OPPOSITE TANK? IF NO, WHICH TANK IS HIGH?
FAULT CODE/ LOCATION
TANK 1 11
TANK 2L 14
TANK 1A 21
TANK 3A 23
TANK 3 31
TANK 2R 34
NO
YES
TK1
TK3
2L
2R
NORMAL
TK 2L/2R
28 24 35 - -
28 24 37 - -
28 24 60 - -
28 24 51 - -
FROM B SH1
TK 1/3
28 24 52 - -
28 24 42 - -
28 24 43 - -
28 24 44 - -
28 24 45 - -
FROM C SH1
NORMAL
28 24 46 - -
28 24 47 - -
28 24 53 - -
28 24 54 - -
REPORT ANY FAULT SYMPTOM OR PATTERN NOT SHOWN ABOVE
28 24 XA - -
ED1-0001-29-080

R Fuel Feed (Sheet 2) - Fault Codes
Figure 2


1/3 QTY
IS TANK 1 OR 3 FUEL QTY INCREASING? IF YES, WHICH TANK?
2L/2R QTY
IS TANK 2L OR 2R FUEL QTY INCREASING? IF YES, WHICH TANK?
ARE FUEL BOOST PUMPS IN TANK WITH INCREASING FUEL STILL ON?
1A/3A XFR
X F R
IS XFR LT ON, BLUE LT OUT?
1, 2L, 2R, 3 QTY
IS TANK (1/3)(2L/2R) DECREASING AT SAME RATE AS OPPOSITE TANK? IF NO, WHICH TANK IS HIGH?
FAULT CODE/ LOCATION
TANK 1 11
TANK 2L 14
TANK 1A 21
TANK 3A 23
TANK 3 31
TANK 2R 34
FROM A SH1
FROM B SH1
FROM C SH1
NO
YES
YES TK1
TK3
YES, TK 1A EMPTY
YES, TK 3A EMPTY
2L
2R
TK 1/3
TK 2L/2R
NORMAL
28 24 38 - -
28 24 39 - -
28 24 40 - -
28 24 41 - -
28 24 42 - -
28 24 43 - -
28 24 46 - -
28 24 47 - -
28 24 48 - -
28 24 49 - -
REPORT ANY FAULT SYMPTOM OR PATTERN NOT SHOWN ABOVE
28 24 XA - -
ED1-0001-28-024

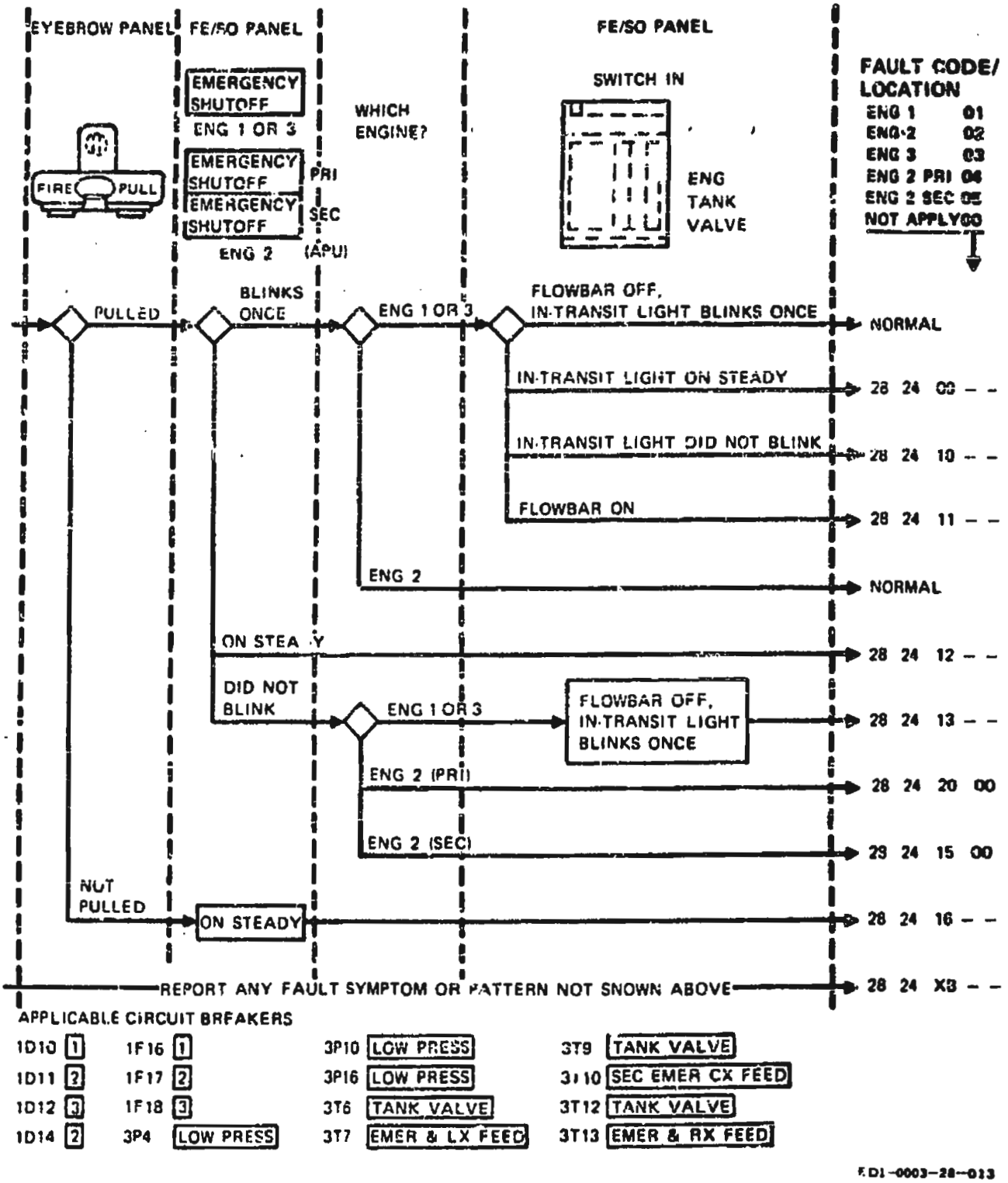
R

Fuel Feed (Sheet 2) - Fault Codes
Figure 3

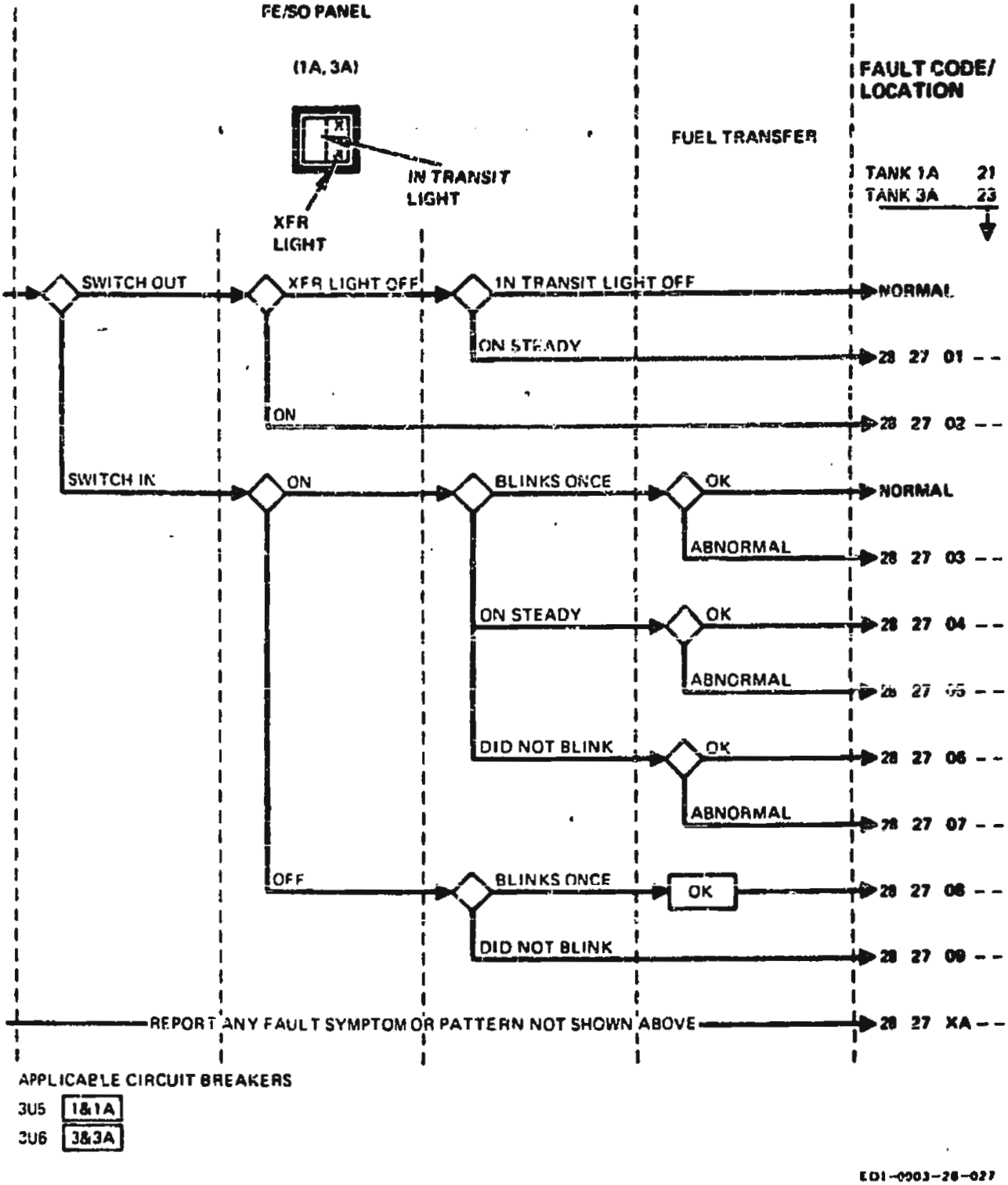
EFFECTIVITY: 025, 026, 028-033

0506

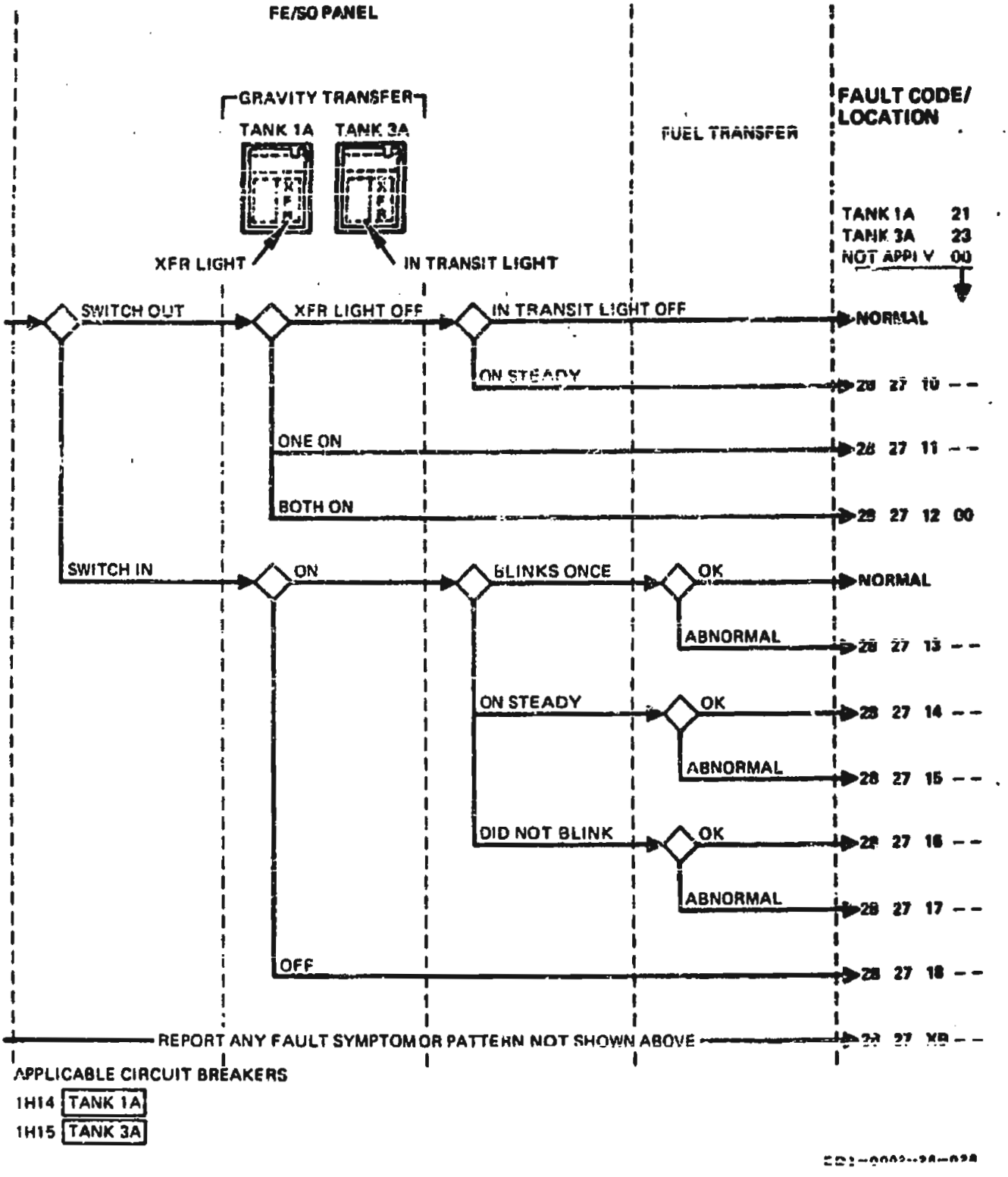
28-FAULT CODE DIAGRAM


EYEBROW PANEL
FE/SO PANEL
EMERGENCY SHUTOFF ENG 1 OR 3
EMERGENCY SHUTOFF PRI
EMERGENCY SHUTOFF SEC
ENG 2 (APU)
FIRE PULL
WHICH ENGINE?
FE/SO PANEL
SWITCH IN
ENG TANK VALVE
FAULT CODE/ LOCATION
ENG 1 01
ENG 2 02
ENG 3 03
ENG 2 PRI 04
ENG 2 SEC 05
NOT APPLY 00
PULLED
BLINKS ONCE
ENG 1 OR 3
FLOWBAR OFF, IN-TRANSIT LIGHT BLINKS ONCE
NORMAL
IN-TRANSIT LIGHT ON STEADY
28 24 00 - -
IN-TRANSIT LIGHT DID NOT BLINK
28 24 10 - -
FLOWBAR ON
28 24 11 - -
ENG 2
NORMAL
ON STEADY
28 24 12 - -
DID NOT BLINK
ENG 1 OR 3
FLOWBAR OFF, IN-TRANSIT LIGHT BLINKS ONCE
28 24 13 - -
ENG 2 (PRI)
28 24 20 00
ENG 2 (SEC)
28 24 15 00
NOT PULLED
ON STEADY
28 24 16 - -
REPORT ANY FAULT SYMPTOM OR PATTERN NOT SHOWN ABOVE
28 24 XX - -
APPLICABLE CIRCUIT BREAKERS
1D10 [1] 1F16 [1] 3P10 [LOW PRESS] 3T9 [TANK VALVE]
1D11 [2] 1F17 [2] 3P16 [LOW PRESS] 3T10 [SEC EMER CX FEED]
1D12 [3] 1F18 [3] 3T6 [TANK VALVE] 3T12 [TANK VALVE]
1D14 [2] 3P4 [LOW PRESS] 3T7 [EMER & LX FEED] 3T13 [EMER & RX FEED]
FD1-0003-28-013

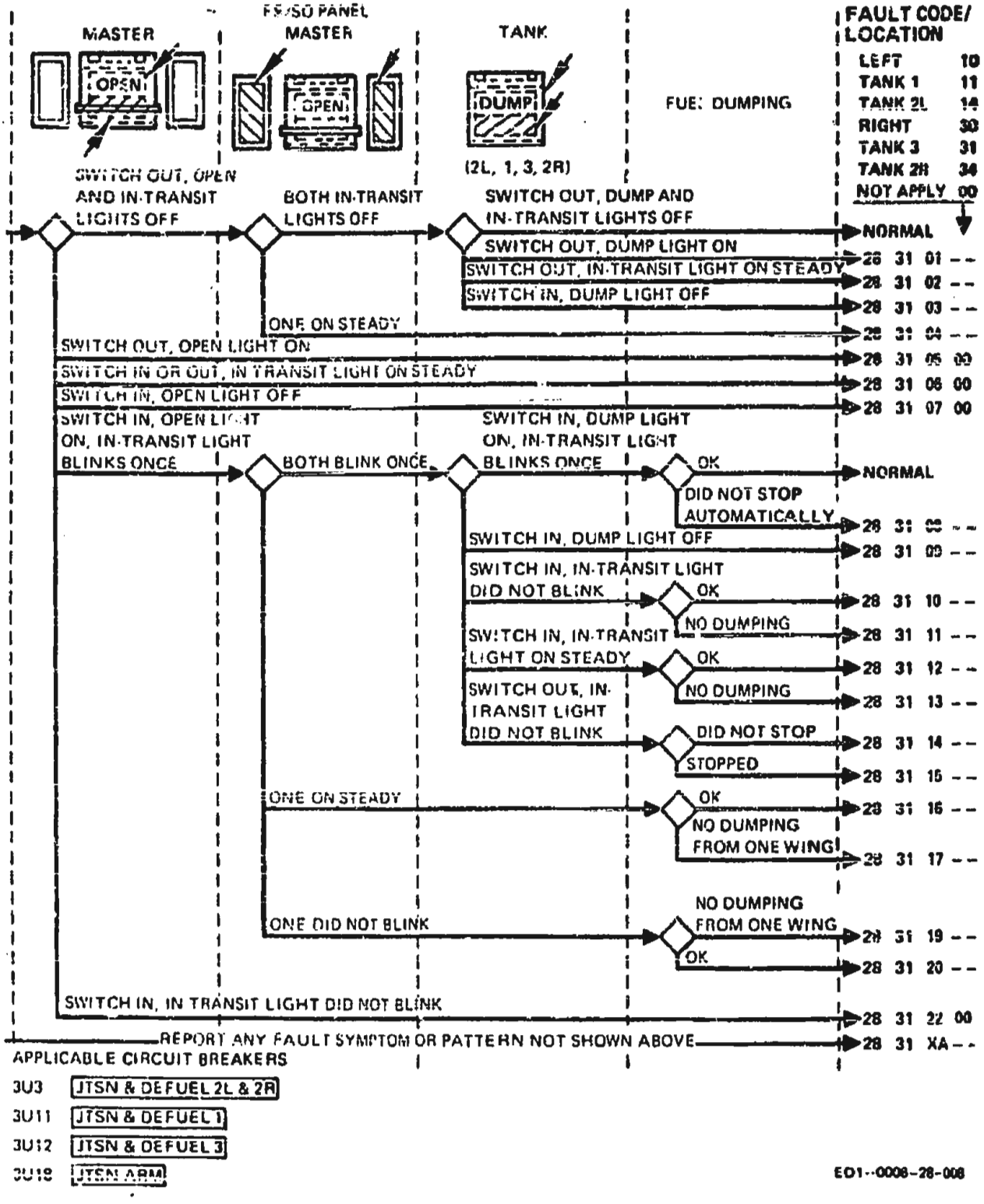
Fuel Shutoff - Fault Codes
Figure 4



Tank 1A/3A Fuel Transfer - Fault Codes
Figure 5



R Tank 1A/3A Gravity Transfer - Fault Codes
Figure 6

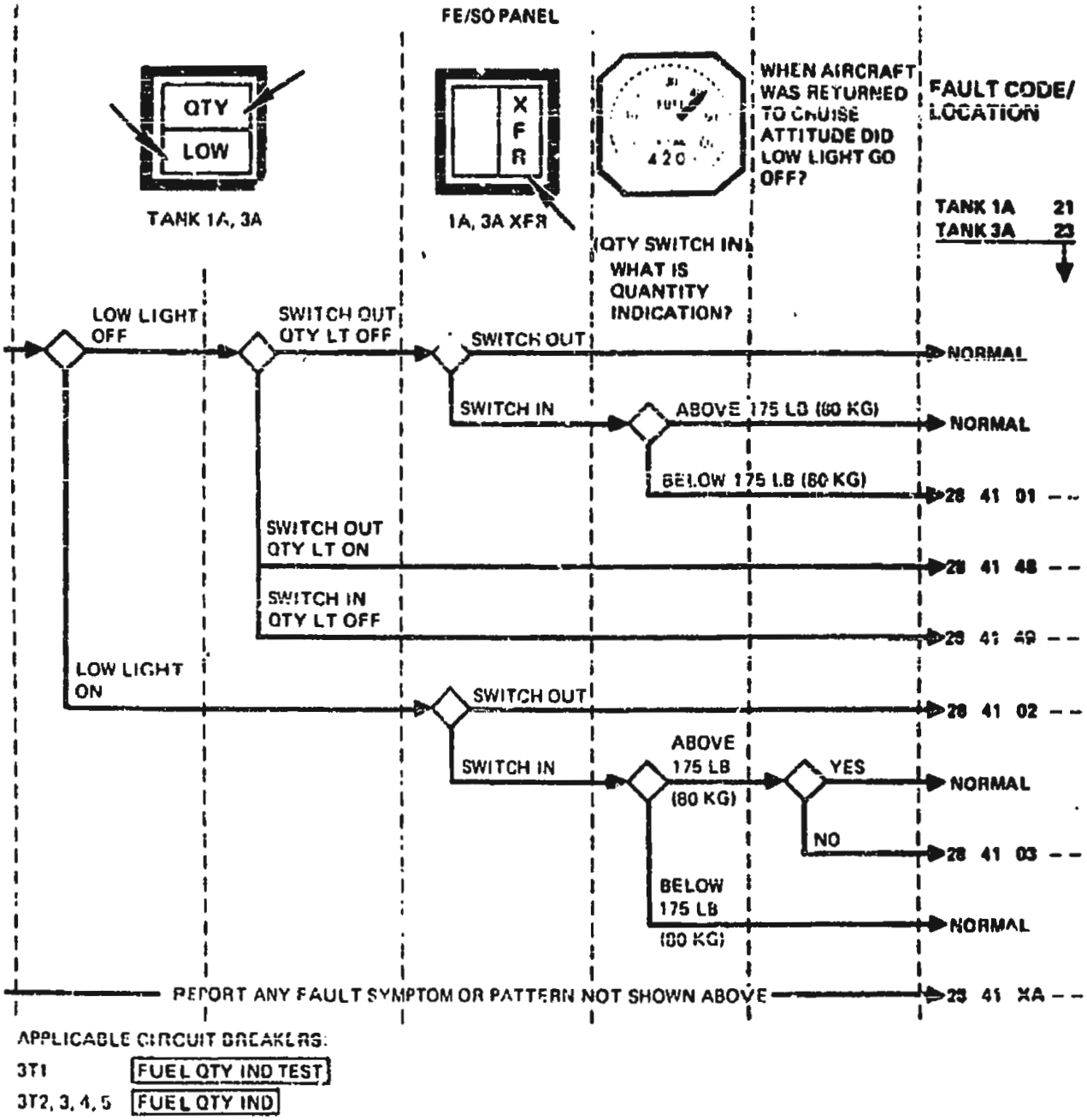

MASTER
OPEN
FE/SO PANEL
MASTER
OPEN
TANK
DUMP
(2L, 1, 3, 2R)
FUEL DUMPING
FAULT CODE/
LOCATION
LEFT 10
TANK 1 11
TANK 2L 14
RIGHT 30
TANK 3 31
TANK 2R 34
NOT APPLY 00
SWITCH OUT, OPEN AND IN-TRANSIT LIGHTS OFF
BOTH IN-TRANSIT LIGHTS OFF
SWITCH OUT, DUMP AND IN-TRANSIT LIGHTS OFF
NORMAL
SWITCH OUT, DUMP LIGHT ON
28 31 01 - -
SWITCH OUT, IN-TRANSIT LIGHT ON STEADY
28 31 02 - -
SWITCH IN, DUMP LIGHT OFF
28 31 03 - -
ONE ON STEADY
28 31 04 - -
SWITCH OUT, OPEN LIGHT ON
28 31 05 00
SWITCH IN OR OUT, IN TRANSIT LIGHT ON STEADY
28 31 06 00
SWITCH IN, OPEN LIGHT OFF
28 31 07 00
SWITCH IN, OPEN LIGHT ON, IN-TRANSIT LIGHT BLINKS ONCE
BOTH BLINK ONCE
SWITCH IN, DUMP LIGHT ON, IN-TRANSIT LIGHT BLINKS ONCE
OK
NORMAL
DID NOT STOP AUTOMATICALLY
28 31 08 - -
SWITCH IN, DUMP LIGHT OFF
28 31 09 - -
SWITCH IN, IN-TRANSIT LIGHT DID NOT BLINK
OK
28 31 10 - -
NO DUMPING
28 31 11 - -
SWITCH IN, IN-TRANSIT LIGHT ON STEADY
OK
28 31 12 - -
NO DUMPING
28 31 13 - -
SWITCH OUT, IN-TRANSIT LIGHT DID NOT BLINK
DID NOT STOP
28 31 14 - -
STOPPED
28 31 15 - -
ONE ON STEADY
OK
28 31 16 - -
NO DUMPING FROM ONE WING
28 31 17 - -
ONE DID NOT BLINK
NO DUMPING FROM ONE WING
28 31 19 - -
OK
28 31 20 - -
SWITCH IN, IN TRANSIT LIGHT DID NOT BLINK
28 31 22 00
REPORT ANY FAULT SYMPTOM OR PATTERN NOT SHOWN ABOVE
28 31 XA - -
APPLICABLE CIRCUIT BREAKERS
3U3 JTSN & DEFUEL 2L & 2R
3U11 JTSN & DEFUEL 1
3U12 JTSN & DEFUEL 3
3U18 JTSN ARM
EO1--0006-28-008

R

Fuel Jettison - Fault Codes
Figure 7

EFFECTIVITY: ALL

28-FAULT CODE DIAGRAM



APPLICABLE CIRCUIT BREAKERS:

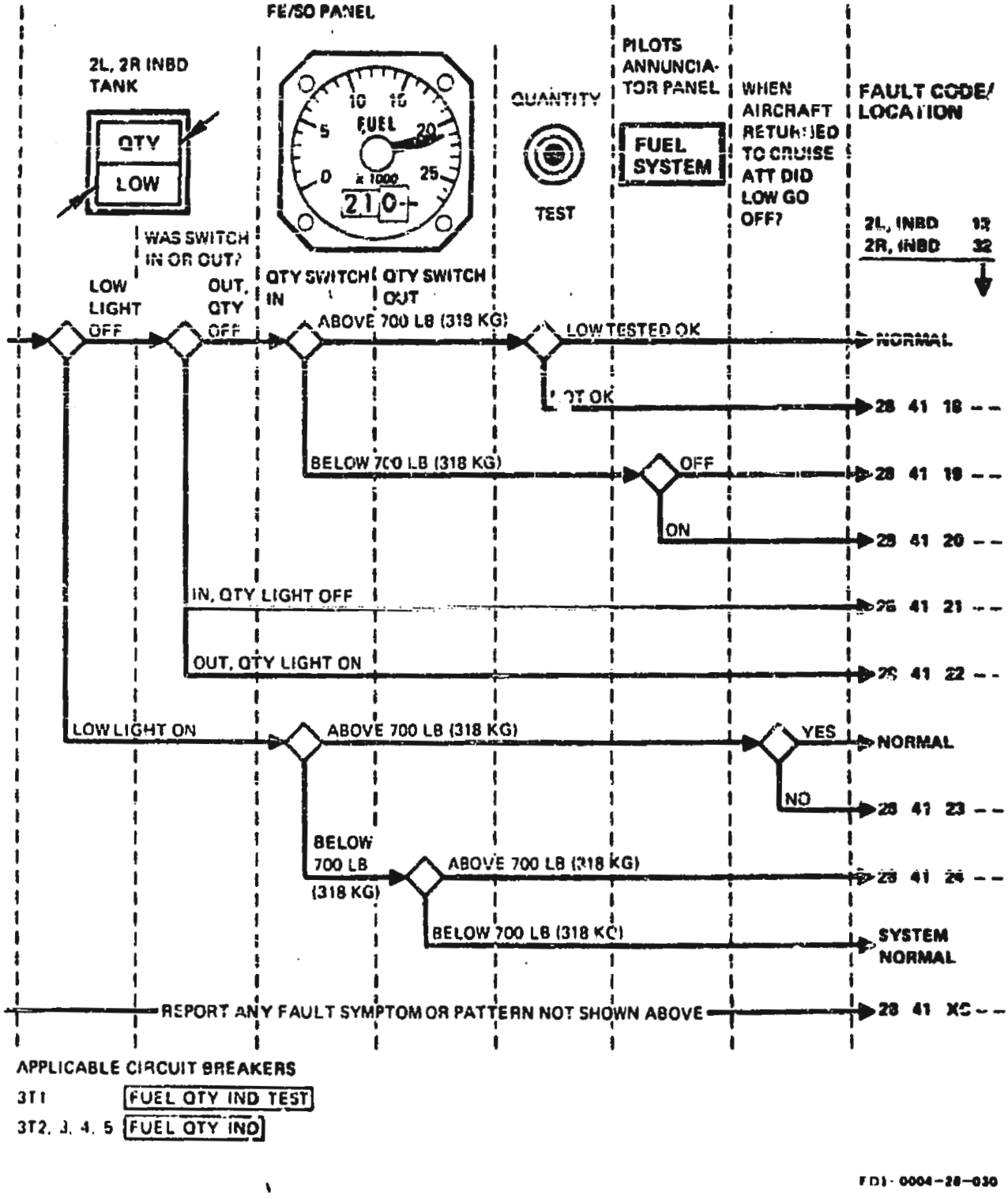
3T1	FUEL QTY IND TEST
3T2, 3, 4, 5	FUEL QTY IND

EO1 0003 38 035

R Tank 1A/3A QTY and LOW Light - Fault Codes
Figure 8

EFFECTIVITY: 025-026, 028-033

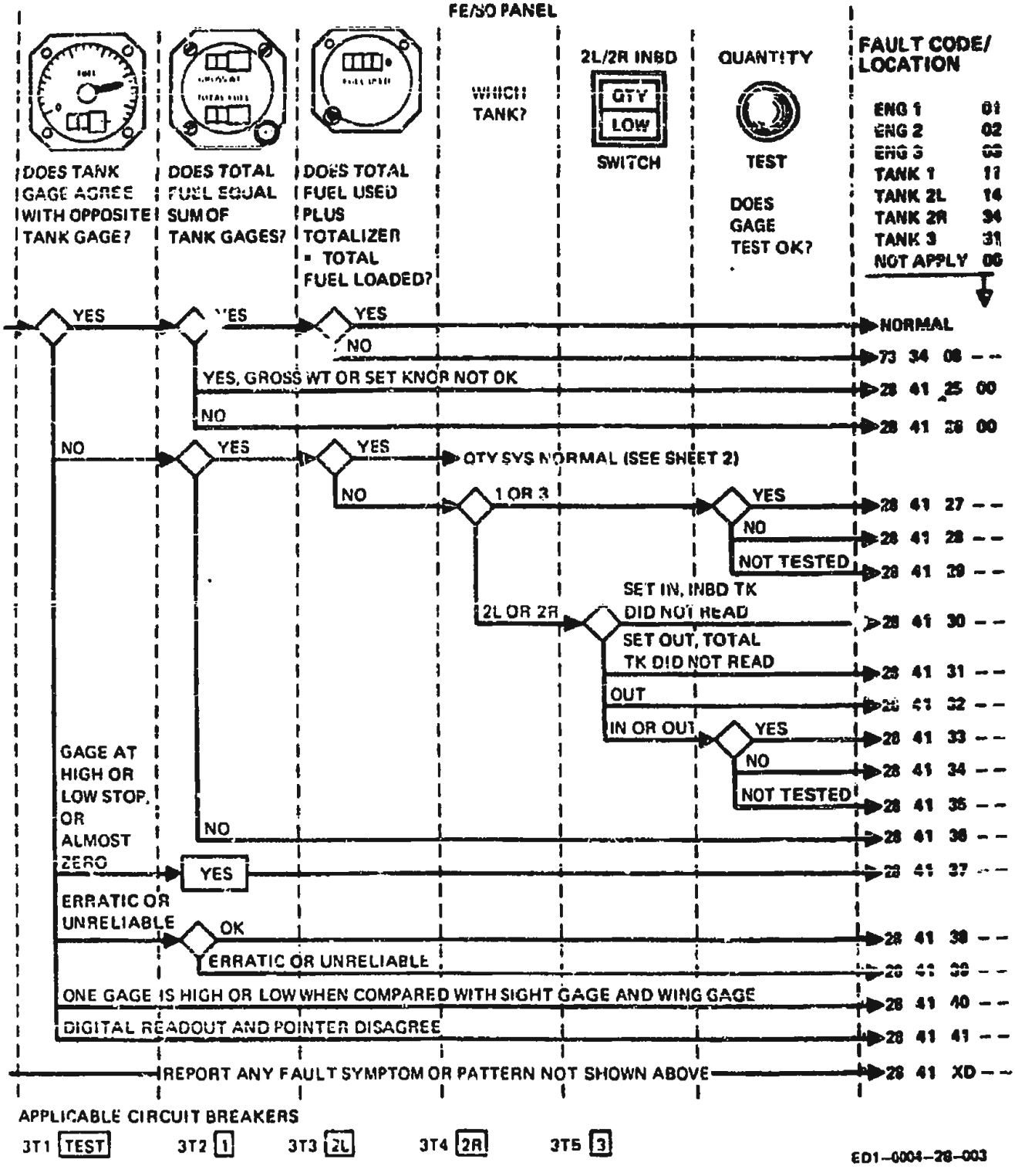
28-FAULT CODE DIAGRAM



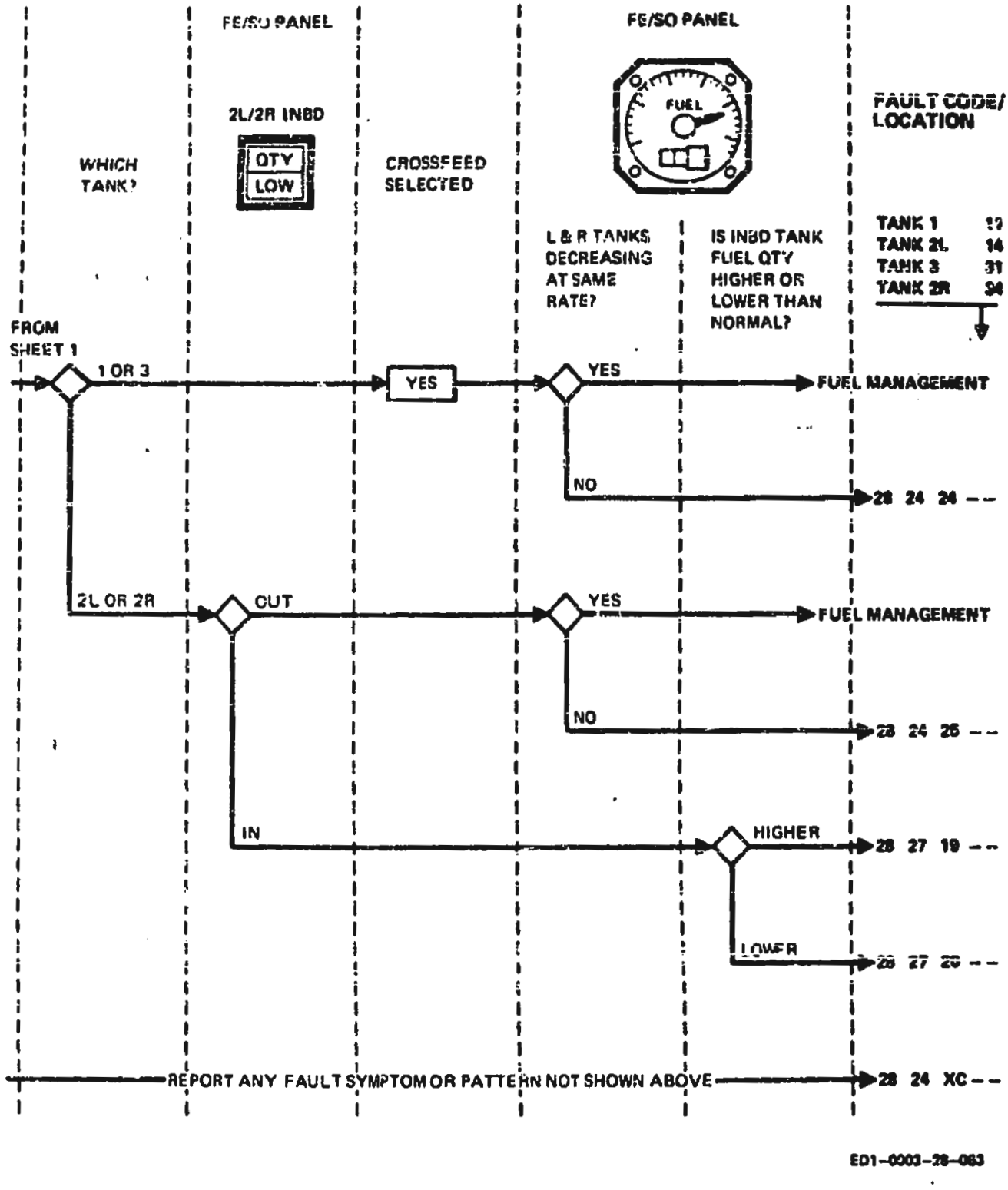
R Tank 2L/2R INBD QTY and LOW Light - Fault Codes
Figure 9

EFFECTIVITY: ALL

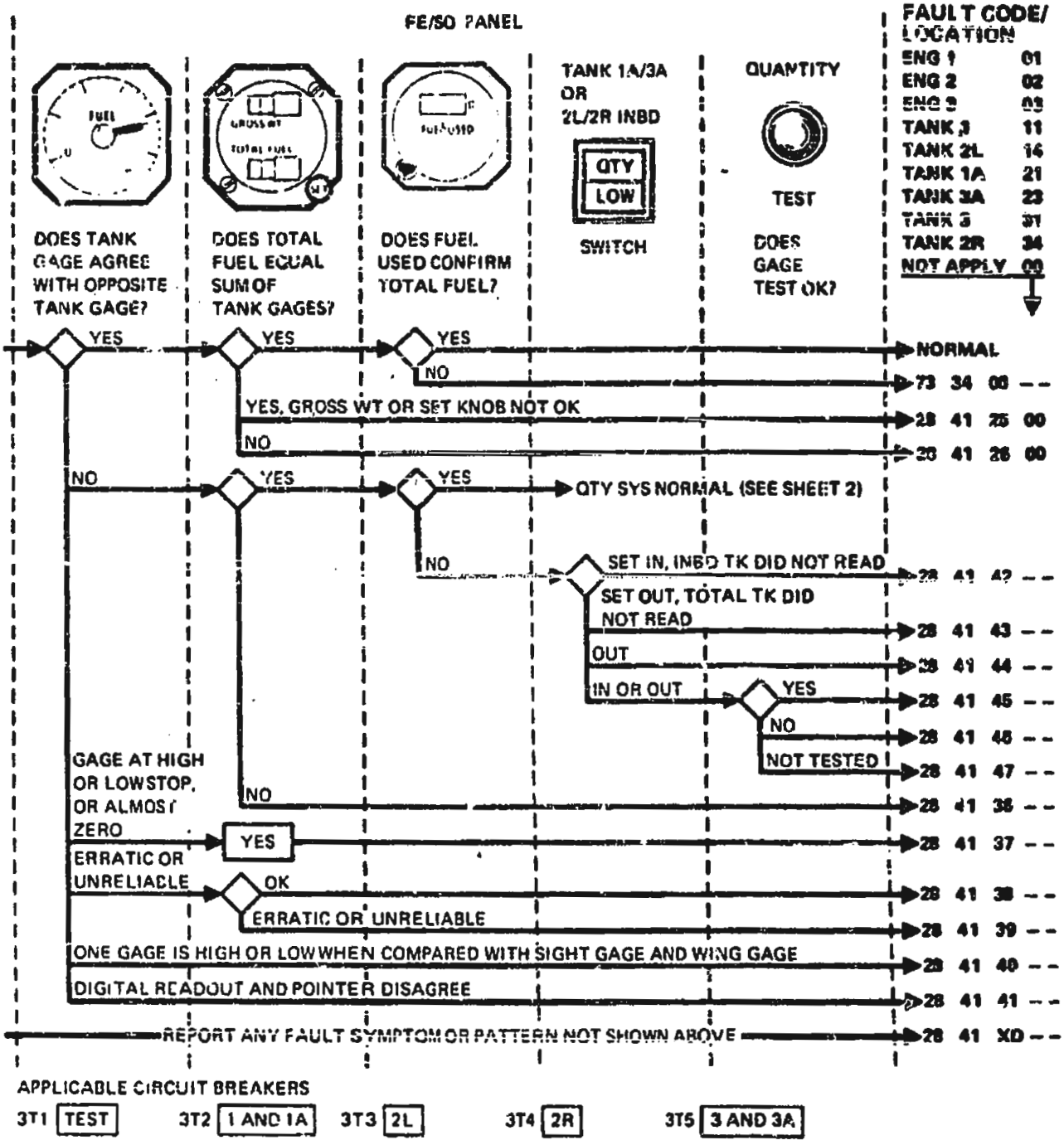
0506


FE/SO PANEL
DOES TANK GAGE AGREE WITH OPPOSITE TANK GAGE?
DOES TOTAL FUEL EQUAL SUM OF TANK GAGES?
DOES TOTAL FUEL USED PLUS TOTALIZER = TOTAL FUEL LOADED?
WHICH TANK?
2L/2R INBD
QTY LOW
SWITCH
QUANTITY
TEST
DOES GAGE TEST OK?
FAULT CODE/ LOCATION
ENG 1 01
ENG 2 02
ENG 3 03
TANK 1 11
TANK 2L 14
TANK 2R 34
TANK 3 31
NOT APPLY 00
YES
NO
NORMAL
73 34 08 - -
YES, GROSS WT OR SET KNOB NOT OK
28 41 25 00
28 41 26 00
QTY SYS NORMAL (SEE SHEET 2)
1 OR 3
28 41 27 - -
28 41 28 - -
NOT TESTED
28 41 29 - -
2L OR 2R
SET IN, INBD TK DID NOT READ
28 41 30 - -
SET OUT, TOTAL TK DID NOT READ
28 41 31 - -
OUT
28 41 32 - -
IN OR OUT
28 41 33 - -
28 41 34 - -
28 41 35 - -
GAGE AT HIGH OR LOW STOP, OR ALMOST ZERO
28 41 36 - -
28 41 37 - -
ERRATIC OR UNRELIABLE
OK
28 41 38 - -
ERRATIC OR UNRELIABLE
28 41 39 - -
ONE GAGE IS HIGH OR LOW WHEN COMPARED WITH SIGHT GAGE AND WING GAGE
28 41 40 - -
DIGITAL READOUT AND POINTER DISAGREE
28 41 41 - -
REPORT ANY FAULT SYMPTOM OR PATTERN NOT SHOWN ABOVE
28 41 XD - -
APPLICABLE CIRCUIT BREAKERS
3T1 TEST
3T2 1
3T3 2L
3T4 2R
3T5 3
ED1-0004-28-003

R Fuel Quantity (Sheet 1) - Fault Codes
Figure 10

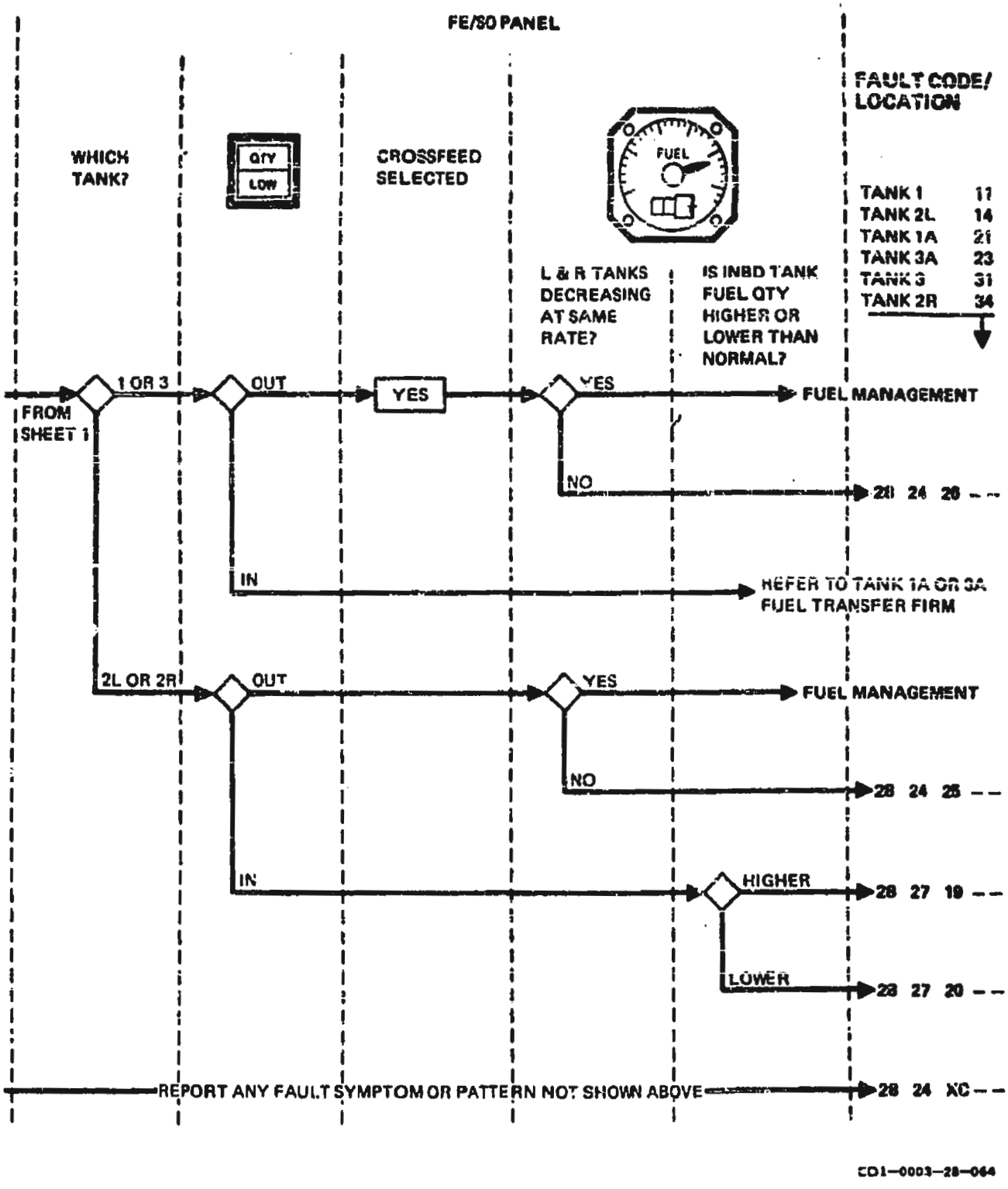


R Fuel Quantity (Sheet 2) - Fault Codes
Figure 11

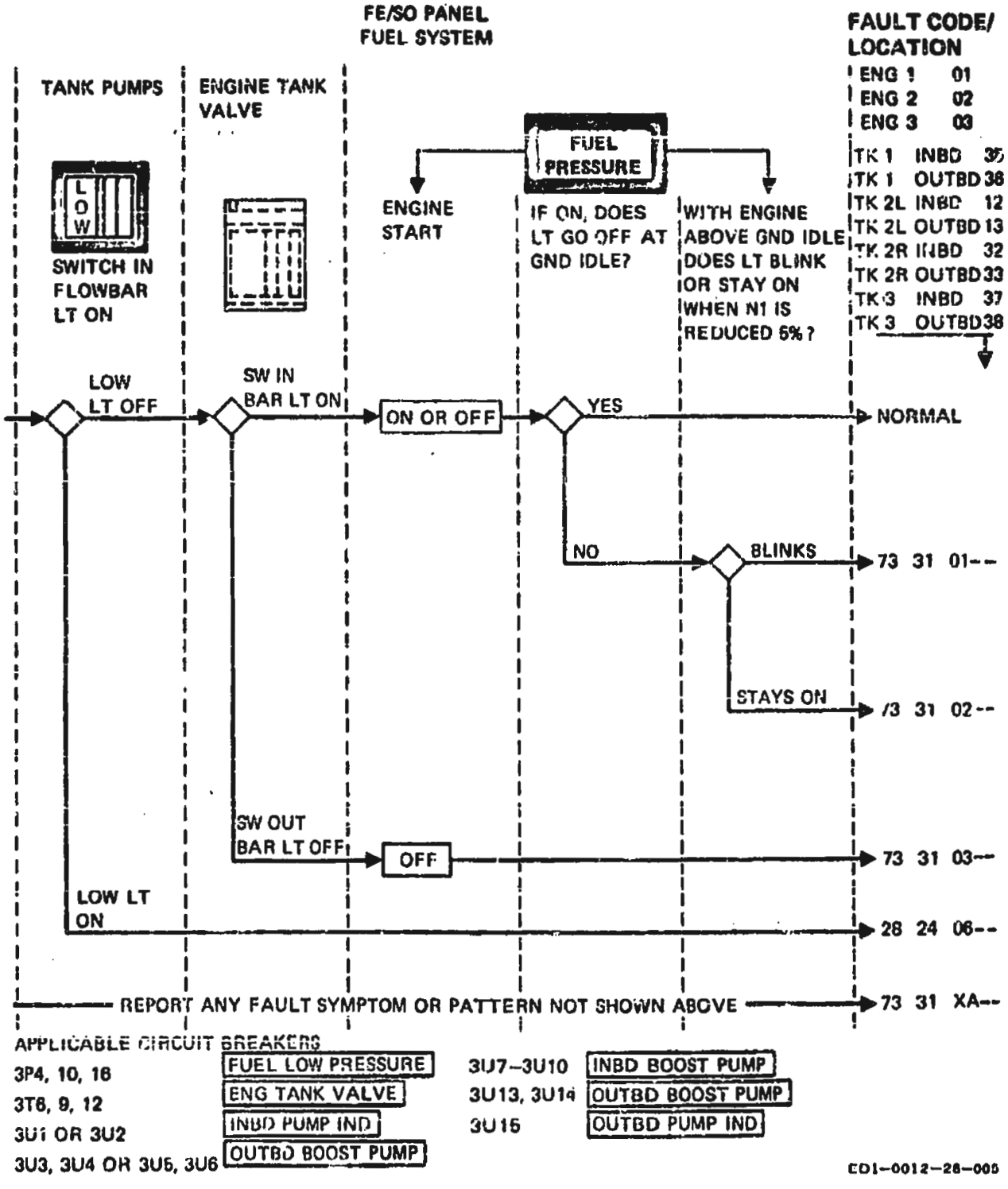


ED1-0008-28-029

R Fuel Quantity (Sheet 1) - Fault Codes
Figure 12



R Fuel Quantity (Sheet 2) - Fault Codes
Figure 13



R Fuel Pressure Light - Fault Codes
Figure 14

FAULT CODE INDEX
TABLE 1

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
28 24 XA __	1. A Fuel Feed fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.)
R R	2. 28-24-00 Fig. 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113 Block 1
28 24 XB __	1. A Fuel Shutoff fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.)
	2. 28-24-00 Fig. 106, 107 Block 1
28 24 XC __	1. A Fuel Quantity fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.)
	2. 28-24-00 Fig. 112, 113 Block 1
28 27 XA __	1. A Tank 1A/3A Fuel Transfer fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.)
	2. 28-27-00 Fig. 104, 105, 106, 110 Block 1
28 27 XB __	1. A Tank 1A/3A Gravity Transfer fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.)
	2. 28-27-00 Fig. 107, 108, 109, Block 1

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
28 31 XA __	1. A Fuel Jettison fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.)
R R	2. 28-31-00 Fig. 103, 104, 105, 106, 107, 108, 109 Block 1
28 41 XA __	1. A Tank 1A/3A QTY and LOW Light fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.)
	2. 28-41-00 Fig. 108, 110 Block 1
28 41 XC __	1. A Tank 2L/2R INBD QTY and LOW Light fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.)
	2. 28-41-00 Fig. 105, 108, 109, Block 1
28 41 XD __	1. A Fuel Quantity fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.)
	2. 28-41-00 Fig. 103, 104, 106, 107, Block 1
28 24 01 00	1. NOT USED.
28 24 02 00	1. NOT USED.
28 24 03 00	1. NOT USED.
28 24 04 00	1. NOT USED.
28 24 05 00	1. NOT USED.

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
28 24 06 __	1. (12=TANK 2L INBD, 13=TANK 2L OUTBD, 32=TANK 2R INBD, 33=TANK 2R OUTBD, 35=TANK 1 INBD, 36=TANK 1 OUTBD, 37=TANK 3 INBD, 38=TANK 3 OUTBD) pumps flowbar on, LOW light on, with switchlight latched in.
	2. 28-24-00 Fig. 103 Block 1 (Pumps 1, 3) 28-24-00 Fig. 104 Block 1 (Pumps 2L, 2R)
28 24 07 00	1. NOT USED.
28 24 08 00	1. NOT USED.
28 24 09 __	1. (01=ENG 1, 03=ENG 3) TANK VALVE in transit light on steady with FIRE PULL handle pulled.
	2. 28-24-00 Fig. 108 Block 14
28 24 10 __	1. (01=ENG 1, 03=ENG 3) TANK VALVE in-transit light did not blink with FIRE PULL handle pulled.
	2. 28-24-00 Fig. 108 Block 1
28 24 11 __	1. (01=ENG 1, 03=ENG 3) TANK VALVE flowbar on with FIRE PULL handle pulled.
	2. 28-24-00 Fig. 110 Block 1
28 24 12 __	1. (01=ENG 1, 03=ENG 3, 04=ENG 2 PRI, 05=ENG 2 SEC) EMERGENCY SHUTOFF light on steady with FIRE PULL handle pulled.
R	2. 28-24-00 Fig. 106 Block 12 (Eng. 1 & 3)
R	28-24-00 Fig. 107 Block 1 (Eng. 2)
28 24 13 __	1. (01=ENG 1, 03=ENG 3) EMERGENCY SHUTOFF light did not blink with FIRE PULL handle pulled. Eng tank valve flowbar off and in-transit light blinked once.
	2. 28-24-00 Fig. 106 Block 6
28 24 14 00	1. NOT USED.

FAULT CODE INDEX
TABLE 1 (CONTINUED)

	FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
	28 24 15 00	1. Engine 2 secondary EMERGENCY SHUTOFF light did not blink with FIRE PULL handle pulled. APU boost pump switch is installed on panel. Tank valve flowbar off.
R		2. 28-24-00 Fig. 107 Block 1
	28 24 16 __	1. (01=ENG 1, 03=ENG 3, 04=ENG 2 PRI, 05=ENG 2 SEC) EMERGENCY SHUTOFF light on steady. FIRE PULL handle not pulled.
R R		2. 28-24-00 Fig. 106 Block 12 (Eng. 1 & 3) 28-24-00 Fig. 107 Block 1 (Eng. 2)
	28 24 17 00	1. NOT USED.
	28 24 18 00	1. NOT USED.
	28 24 19 00	1. NOT USED.
	28 24 20 00	1. Engine 2 primary EMERGENCY SHUTOFF light did not blink with FIRE PULL handle pulled.
		2. 28-24-00 Fig. 107 Block 7 (W/O SB28-019) 28-24-00 Fig. 107 Block 6 (W/SB28-019)
	28 24 21 00	1. NOT USED.
	28 24 22 00	1. NOT USED.
	28 24 23 00	1. NOT USED.
	28 24 24 __	1. (11=TANK 1, 31=TANK 3) gage higher than opposite gage (not decreasing at same rate) with cross feed selected. Fuel used confirms total fuel.
		2. 28-24-00 Fig. 112 Block 2

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
28 24 25 __	1. (14=TANK 2L, 34=TANK 2R) gage higher than opposite gage (not decreasing at same rate) with quantity switchlight out. Fuel used confirms total fuel. 2. 28-24-00 Fig. 113 Block 2
28 24 26 __	1. (11=TANK 1, 31=TANK 3) gage higher than opposite gage (not decreasing at same rate) with cross feed selected. FUEL USED confirms total fuel with quantity select switch out. 2. 28-24-00 Fig. 112 Block 2
28 24 27 00	1. NOT USED.
28 24 28 __	1. (01=ENG 1, 02=ENG 2, 03=ENG 3) tank valve switchlight flowbar light out; in-transit light out. Engine starts and runs. 2. 28-24-00 Fig. 110 Block 5 (Tank 1 or 3) 28-24-00 Fig. 111 Block 4 (Tank 2)
28 24 29 __	1. (01=ENG 1, 02=ENG 2, 03=ENG 3) tank valve switch latched in. Flowbar off, in-transit light stays on. FUEL PRESSURE light on; engine does not run. 2. 28-24-00 Fig. 110 Block 5 (Tank 1 or 3) 28-24-00 Fig. 111 Block 4 (Tank 2)
R 28 24 30 __	1. (12=TANK 2L INBD, 13=TANK 2L OUTBD, 32=TANK 2R INBD, 33=TANK 2R OUTBD, 35=TANK 1 INBD, 36=TANK 1 OUTBD, 37=TANK 3 INBD, 38=TANK 3 OUTBD) boost pump switchlight latched in, flowbar off, LOW light off. FUEL PRESSURE light off, engine runs. 2. 28-24-00 Fig. 105 Block 4

FAULT CODE INDEX
TABLE 1 (CONTINUED)

	FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
R	28 24 31 __	1. (12=TANK 2L INBD, 13=TANK 2L OUTBD, 32=TANK 2R INBD, 33=TANK 2R OUTBD, 35=TANK 1 INBD, 36=TANK 1 OUTBD, 37=TANK 3 INBD, 38=TANK 3 OUTBD) boost pump switchlight latched in, flowbar light on, LOW light on.
		2. 28-24-00 Fig. 103 Block 1 (Tank 1 or 3) 28-24-00 Fig. 104 Block 1 (Tank 2)
R	28 24 32 __	1. (12=TANK 2L INBD, 13=TANK 2L OUTBD, 32=TANK 2R INBD, 33=TANK 2R OUTBD, 35=TANK 1 INBD, 36=TANK 1 OUTBD, 37=TANK 3 INBD, 38=TANK 3 OUTBD) boost pump switchlight latched in, flowbar light on, LOW light on. Boost pump CB tripped.
		2. 28-24-00 Fig. 103 Block 4 (Tank 1 or 3) 28-24-00 Fig. 104 Block 4 (Tank 2)
R	28 24 33 __	1. (12=TANK 2L INBD, 13=TANK 2L OUTBD, 32=TANK 2R INBD, 33=TANK 2R OUTBD, 35=TANK 1 INBD, 36=TANK 1 OUTBD, 37=TANK 3 INBD, 38=TANK 3 OUTBD) boost pump switchlight when latched in, shorts out panel indicator lights.
		2. 28-24-00 Fig. 105 Block 5
	28 24 34 __	1. (01=ENG 1, 02=ENG 2, 03=ENG 3) tank valve switch, when latched in, shorts out panel indicator lights.
		2. 28-24-00 Fig 110 Block 6 (Tank 1 or 3) 28-24-00 Fig. 111 Block 5 (Tank 2)
	28 24 35 __	1. (14=TANK 2L, 34=TANK 2R) fuel decreasing at slower rate than opposite tank. Crossfeed valves closed, 2L and 2R boost pumps on.
		2. 28-24-00 Fig. 113 Block 1

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
28 24 36 __	1. (11=TANK 1, 31=TANK 3) fuel decreasing at slower rate than opposite tank. Crossfeed valves closed, Tank 1 and 3 boost pumps on; Tank (1A, 3A) fuel transfer valve open. 2. 28-24-00 Fig. 112 Block 1
28 24 37 __	1. (14=TANK 2L, 34=TANK 2R) boost pumps off, fuel quantity increasing; crossfeed valves closed. 2. 28-24-00 Fig. 113 Block 1
28 24 38 __	1. (11=TANK 1) fuel quantity increasing. Crossfeed valves closed; Tank 1A fuel XFR valve open, Tank 1A empty. Tank 2R fuel decreasing faster than Tank 2L. 2. 28-24-00 Fig. 112 Block 1
28 24 39 __	1. (31=TANK 3) fuel quantity increasing. Crossfeed valves closed; Tank 3A fuel XFR valve open, Tank 3A empty. Tank 2L fuel decreasing faster than Tank 2R. 2. 28-24-00 Fig. 112 Block 1
28 24 40 __	1. (11=TANK 1, 31=TANK 3) fuel not decreasing at same rate as opposite tank. Tank 1 and 3 on crossfeed; Tank 1A/3A fuel XFR valves closed. 2. 28-24-00 Fig. 112 Block 1
28 24 41 __	1. (11=TANK 1, 31=TANK 3) fuel not decreasing at same rate as opposite tank. Tank 1 and 3 on crossfeed; Tank 1A/3A fuel XFR valves open. 2. 28-24-00 Fig. 112 Block 1

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
28 24 42 __	1. (14=TANK 2L, 34=TANK 2R) fuel boost pumps on, fuel quantity increasing. Tank 1 and 3 on crossfeed.
	2. 28-24-00 Fig. 112 Block 1
28 24 43 __	1. (14=TANK 2L, 34=TANK 2R) fuel boost pumps off, fuel quantity increasing. Tank 1 and 3 on crossfeed.
	2. 28-24-00 Fig. 112 Block 1
28 24 44 __	1. (11=TANK 1, 31=TANK 3) fuel boost pumps off, fuel quantity increasing. Tank 1 and 3 on crossfeed.
	2. 28-24-00 Fig. 112 Block 1
28 24 45 __	1. (11=TANK 1, 31=TANK 3) fuel boost pumps off, fuel quantity increasing. Tank 1 and 3 on crossfeed.
	2. 28-24-00 Fig. 112 Block 1
28 24 46 __	1. (14=TANK 2L, 34=TANK 2R) boost pumps on, fuel quantity increasing. Tank 2L and 2R on crossfeed.
	2. 28-24-00 Fig. 113 Block 1
28 24 47 __	1. (14=TANK 2L, 34=TANK 2R) boost pumps off, fuel quantity increasing. Tank 2L and 2R on crossfeed.
	2. 28-24-00 Fig. 113 Block 1
28 24 48 __	1. (11=TANK 1) fuel quantity increasing; Tank 2R decreasing faster than Tank 2L. Tank 2L and 2R on crossfeed. Tank 1A fuel XFR valve open; Tank 1A empty.
	2. 28-24-00 Fig. 112 Block 1

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
28 24 49 __	1. (31=TANK 3) fuel quantity increasing; Tank 2L decreasing faster than Tank 2R. Tank 2L and 2R on crossfeed. Tank 3A fuel XFR Tank 3A empty. 2. 28-24-00 Fig. 112 Block 1
28 24 50 __	1. (11=TANK 1) fuel quantity increasing; crossfeed valves closed. Tank 2R decreasing faster than Tank 2L. 2. 28-24-00 Fig. 112 Block 1
28 24 51 __	1. (31=TANK 3) fuel quantity increasing; crossfeed valves closed. Tank 2L decreasing faster than Tank 2R. 2. 28-24-00 Fig. 112 Block 1
28 24 52 __	1. (11=TANK 1, 31=TANK 3) fuel not decreasing at same rate as opposite tank. Tank 1 and 3 on crossfeed. 2. 28-24-00 Fig. 112 Block 1
28 24 53 __	1. (11=TANK 1) fuel quantity increasing; Tank 2R decreasing faster than Tank 2L. Tank 2L and 2R on crossfeed. 2. 28-24-00 Fig. 112 Block 1
28 24 54 __	1. (31=TANK 3) fuel quantity increasing; Tank 2L decreasing faster than Tank 2R. Tank 2L and 2R on crossfeed. 2. 28-24-00 Fig. 112 Block 1
28 26 01 00	1. NOT USED.
28 26 02 00	1. NOT USED.
28 26 03 00	1. NOT USED.
28 26 04 00	1. NOT USED.

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
28 26 05 __	1. (10=LEFT, 20=CENTER, 30=RIGHT) crossfeed valve switchlight latched in. Flowbar on; in-transit light stays on.
	2. 28-26-00 Fig. 103 Block 6
28 26 06 __	1. (10=LEFT, 20=CENTER, 30=RIGHT) crossfeed valve switchlight latched in. Flowbar on; in-transit light stays off.
	2. 28-26-00 Fig. 103 Block 7
28 26 07 __	1. (10=LEFT, 20=CENTER, 30=RIGHT) crossfeed valve switchlight latched in. Flowbar off; in-transit light on, then off.
	2. 28-26-00 Fig. 103 Block 1
28 26 08 __	1. (10=LEFT, 20=CENTER, 30=RIGHT) crossfeed valve switchlight, when latched in, shorts out panel indicator lights.
	2. 28-26-00 Fig. 104 Block 5
28 27 01 __	1. (21=TANK 1A, 23=TANK 3A) fuel XFR in-transit light on steady with switchlight unlatched.
	2. 28-27-00 Fig. 105 Block 1
28 27 02 __	1. (21=TANK 1A, 23=TANK 3A) XFR switchlight unlatched, XFR light on.
	2. 28-27-00 Fig. 106 Block 9
28 27 03 __	1. (21=TANK 1A, 23=TANK 3A) fuel transfer abnormal with switchlight latched in. In-transit light blinked.
	2. 28-27-00 Fig. 106 Block 1

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
28 27 04 __	1. (21=TANK 1A, 23=TANK 3A) fuel XFR in-transit light on steady with switchlight latched in. Transfer OK.
	2. 28-27-00 Fig. 105 Block 8
28 27 05 __	1. (21=TANK 1A, 23=TANK 3A) fuel transfer abnormal with switchlight latched in. In-transit light on steady.
	2. 28-27-00 Fig. 105 Block 8
28 27 06 __	1. (21=TANK 1A, 23=TANK 3A) fuel XFR in-transit light did not blink with switchlight latched in. Transfer OK.
	2. 28-27-00 Fig. 105 Block 4
28 27 07 __	1. (21=TANK 1A, 23=TANK 3A) fuel transfer abnormal with switchlgiht latched in. In-transit light did not blink.
	2. 28-27-00 Fig. 110 Block 3
28 27 08 __	1. (21=TANK 1A, 23=TANK 3A) XFR light off with switchlight latched in.
	2. 28-27-00 Fig. 106 Block 2
28 27 09 __	1. (21=TANK 1A, 23=TANK 3A) XFR switchlight in, XFR light off; in-transit light did not blink.
	2. 28-27-00 Fig. 106 Block 2
28 27 10 __	1. (21=TANK 1A, 23=TANK 3A) gravity transfer in-transit light on steady with switchlight unlatched.
	2. 28-27-00 Fig. 108 (Sheet 1) Block 9

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
28 27 11 __	1. (21=TANK 1A, 23=TANK 3A) gravity transfer XFR light on with switchlight unlatched.
	2. 28-27-00 Fig. 109 Block 6
28 27 12 00	1. Both gravity transfer XFR lights on with switchlights unlatched.
	2. 28-27-00 Fig. 109 Block 9
28 27 13 __	1. (21=TANK 1A, 23=TANK 3A) gravity transfer abnormal with switchlight latched in. In-transit light blinked.
	2. 28-27-00 Fig. 107 Block 1
28 27 14 __	1. (21=TANK 1A, 23=TANK 3A) gravity transfer in-transit light on steady with switchlight latched in. Fuel transfer OK.
	2. 28-27-00 Fig. 108 (Sheet 1) Block 10
28 27 15 __	1. (21=TANK 1A, 23=TANK 3A) gravity transfer abnormal with switchlight latched in. In-transit light on steady.
	2. 28-27-00 Fig. 107 Block 1
28 27 16 __	1. (21=TANK 1A, 23=TANK 3A) gravity transfer in-transit light did not blink with switchlight latched in. Transfer OK.
	2. 28-27-00 Fig. 108 (Sheet 1) Block 4
28 27 17 __	1. (21=TANK 1A, 23=TANK 3A) gravity transfer abnormal with switchlight latched in. In-transit light did not blink.
	2. 28-27-00 Fig. 108 (Sheet 1) Block 4

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
28 27 18 __	1. (21=TANK 1A, 23=TANK 3A) gravity transfer XFR light off with switchlight latched in.
	2. 28-27-00 Fig. 109 Block 2
28 27 19 __	1. (14=TANK 2L, 34-TANK 2R) inboard quantity higher than normal with quantity select switchlight latched in. Fuel quantity gages OK.
	2. 28-27-00 Fig. 103 Block 1
28 27 20 __	1. (14=TANK 2L, 34=TANK 2R) inboard tank quantity lower than normal with quantity select switchlight latched in. FUEL USED confirms total fuel.
	2. 28-27-00 Fig. 103 Block 1
28 31 01 __	1. (11=TANK 1, 14=TANK 2L, 31=TANK 3, 34=Tank 2R) fuel DUMP light on with switchlight unlatched.
	2. 28-31-00 Fig. 108 Block 5
28 31 02 __	1. (11=TANK 1, 14=TANK 2L, 31=TANK 3, 34=TANK 2R) fuel dump in-transit light on with switchlight unlatched
	2. 28-31-00 Fig. 105 Block 2
28 31 03 __	1. (11=TANK 1, 14=TANK 2L, 31=TANK 3, 34=TANK 2R) fuel DUMP light off with switchlight latched in.
	2. 28-31-00 Fig. 108 Block 4
28 31 04 __	1. (10=LEFT, 30=RIGHT) jettison valve in-transit light on steady. Master switchlight unlatched.
	2. 28-31-00 Fig. 107 Block 5

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
28 31 05 00	1. Jettison master switch OPEN light on with switchlight unlatched.
	2. 28-31-00 Fig. 108 Block 5
28 31 06 00	1. MASTER in-transit light on steady with switchlight latched in or unlatched.
	2. 28-31-00 Fig. 106 Block 1
28 31 07 00	1. MASTER switch OPEN light off with switchlight latched in.
	2. 28-31-00 Fig. 108 Block 4
28 31 08 __	1. (11=TANK 1, 14=TANK 2L, 31=TANK 3, 34=TANK 2R) fuel dumping did not stop automatically. All other jettison indications normal.
	2. 28-31-00 Fig. 103 Block 1
28 31 09 __	1. (11=TANK 1, 14=TANK 2L, 31=TANK 3, 34=Tank 2R) fuel DUMP light off with switchlight latched in. Dumping normal.
	2. 28-31-00 Fig. 108 Block 4
28 31 10 __	1. (11=TANK 1, 14=TANK 2L, 31=TANK 3, 34=TANK 2R) fuel dump in-transit light did not blink with switch light latched in and Master switch light latched in. Dumping normal.
	2. 28-31-00 Fig. 104 Block 1
28 31 11 __	1. (11=TANK 1, 14=TANK 2L, 31=TANK 3, 34=TANK 2R) did not dump fuel. Fuel dump in-transit light did not blink with switch light latched in.
	2. 28-31-00 Fig. 104 Block 1

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
28 31 12 __	1. (11=TANK 1, 14=TANK 2L, 31=TANK 3, 34=TANK 2R) fuel dump in-transit light on steady with switch light latched in. Dumping OK.
	2. 28-31-00 Fig. 105 Block 6
28 31 13 __	1. (11=TANK 1, 14=TANK 2L, 31=TANK 3, 34=TANK 2R) fuel did not dump. Fuel dump in-transit light on steady with switch light latched in.
	2. 28-31-00 Fig. 105 Block 5
28 31 14 __	1. (11=TANK 1, 14=TANK 2L, 31=TANK 3, 34=TANK 2R) fuel dumping did not stop. Fuel dump in-transit light did not blink when switch light unlatched.
	2. 28-31-00 Fig. 103 Block 3
28 31 15 __	1. (11=TANK 1, 14=TANK 2L, 31=TANK 3, 34=TANK 2R) fuel dump in-transit light did not blink when switch light unlatched. Fuel dumping stopped.
	2. 28-31-00 Fig. 109 Block 1
28 31 16 __	1. (10=LEFT, 30=RIGHT) fuel jettison valve in-transit light on steady with Master switch light latched in. Dumping OK.
	2. 28-31-00 Fig. 107 Block 12
28 31 17 __	1. (10=LEFT, 30=RIGHT) wing did not dump fuel. Jettison valve in-transit light on steady with Master switch light latched in
	2. 28-31-00 Fig. 107 Block 12
28 31 18 00	1. NOT USED.

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
28 31 19 __	1. (10=LEFT, 30=RIGHT) wing did not dump fuel. Jettison valve in-transit light did not blink with Master switchlight latched in.
	2. 28-31-00 Fig. 107 Block 8
28 31 20 __	1. (10=LEFT 30=RIGHT) jettison valve in-transit light did not blink with Master switch light latched in. Fuel dump OK from both wings.
	2. 28-31-00 Fig. 107 Block 8
28 31 21 00	1. NOT USED.
28 31 22 00	1. MASTER switch in-transit light did not blink with switch light latched in.
	2. 28-31-00 Fig. 106 Block 6
28 41 01 __	1. (21=TANK 1A, 23=TANK 3A) LOW light off with transfer switch in and tank fuel quantity below 175 lbs (80 Kg).
	2. 28-41-00 Fig. 108 Block 1
28 41 02 __	1. (21=TANK 1A, 23=TANK 3A) LOW light on with transfer switchlight out.
	2. 28-41-00 Fig. 110 Block 5
28 41 03 __	1. (21=TANK 1A, 23=TANK 3A) LOW light on with transfer switchlight in and tank fuel quantity above 175 lbs (80 Kg). LOW light did not go off when aircraft was returned to cruise attitude.
	2. 28-41-00 Fig. 110 Block 4
28 41 04 00	1. NOT USED.
28 41 05 00	1. NOT USED.
28 41 06 00	1. NOT USED.
28 41 07 00	1. NOT USED.

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
28 41 08 00	1. NOT USED.
28 41 09 00	1. NOT USED.
28 41 10 00	1. NOT USED.
28 41 11 00	1. NOT USED.
28 41 12 00	1. NOT USED.
28 41 13 00	1. NOT USED.
28 41 14 00	1. NOT USED.
28 41 15 00	1. NOT USED.
28 41 16 00	1. NOT USED.
28 41 17 00	1. NOT USED.
28 41 18 __	1. (12=2L INBD, 32=2R INBD) TANK LOW light did not test when QUANTITY TEST switch pressed. Inboard tank quantity above 700 pounds (318 Kg). 2. 28-41-00 Fig. 108 Block 3
28 41 19 __	1. (12=2L INBD), 32=2R INBD) LOW light off with tank fuel quantity below 700 lbs (318 Kg). 2. 28-41-00 Fig. 108 Block 3
28 41 20 __	1. (12=2L INBD, 32=2R INBD) TANK QUANTITIY LOW light off with inboard tank quantity less than 700 pounds (318 Kg). FUEL SYSTEM annunciator light on. 2. 28-41-00 Fig. 108 Block 3
28 41 21 __	1. (12=TANK 2L INBD, 32=TANK 2R INBD) QTY light off with switchlight in. 2. 28-41-00 Fig. 105 Block 5

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
28 41 22 __	1. (12=TANK 2L INBD, 32=TANK 2R INBD) QTY light on with switchlight out. 2. 28-41-00 Fig. 105 Block 6
28 41 23 __	1. (12=2L INBD, 32=2R INBD) LOW light on with tank fuel quantity above 700 lbs (318 Kg). 2. 28-41-00 Fig. 109 Block 2
28 41 24 __	1. (12=2L INBD, 32=2R INBD) TANK LOW light on with inboard quantity less than 700 pounds (318 Kg) but total tank above 700 pounds (318 Kg). 2. 28-41-00 Fig. 109 Block 6
28 41 25 00	1. GROSS WT SET knob not OK. Fuel quantities OK. 2. 28-41-00 Fig. 106 Block 6
28 41 26 00	1. TOTAL FUEL not OK. Fuel quantities OK. 2. 28-41-00 Fig. 106 Block 6
28 41 27 __	1. (11=TANK 1, 31=TANK 3) indicator disagrees wth opposite indicator. FUEL USED does not confirm total fuel. Indicator OK when tested. Tank 1 Reading ____ and Tank 3 Reading ____. 2. 28-41-00 Fig. 103 (Sheet 2) Block 3
28 41 28 __	1. (11=TANK 1, 31=TANK 3) indicator disagrees with opposite indicator. FUEL USED does not confirm total fuel. Indicator did not test OK. 2. 28-41-00 Fig. 103 (Sheet 1) Block 9
28 41 29 __	1. (11=TANK 1, 31=TANK 3) indicator disagrees with opposite indicator. FUEL USED does not confirm total fuel. Indicator does not test. 2. 28-41-00 Fig. 103 (Sheet 1) Block 3

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
28 41 30 __	1. (12=2L INBD, 32=2R INBD) TANK indicator did not read with switchlight in.
	2. 28-41-00 Fig. 104 Block 7
28 41 31 __	1. (14=TANK 2L, 34=TANK 2R) indicator did not change with quantity switchlight out.
	2. 28-41-00 Fig. 104 Block 7
28 41 32 __	1. (14=TANK 2L, 34=TANK 2R) indicator disagrees with opposite indicator. FUEL USED does not confirm total fuel with quantity switchlight out. OK with switchlight in.
	2. 28-41-00 Fig. 103 (Sheet 2) Block 2
28 41 33 __	1. (14=TANK 2L, 34=TANK 2R) Indicator disagrees with opposite indicator. FUEL USED does not confirm total fuel with quantity switchlight in or out. Indicator OK when tested. Tank 2L Reading ____ and Tank 2R Reading ____.
	2. 28-41-00 Fig. 103 (Sheet 2) Block 2
28 41 34 __	1. (14=TANK 2L, 34=TANK 2R) indicator disagrees with opposite indicator. FUEL USED does not confirm total fuel with quantity switchlight in or out. Indicator not OK when tested.
	2. 28-41-00 Fig. 103 (Sheet 1) Block 1
28 41 35 __	1. (14=TANK 2L, 34=TANK 2R) indicator disagrees with opposite indicator. Fuel used does not confirm total fuel with quantity switchlight in or out. Indicator does not test.
	2. 28-41-00 Fig. 103 (Sheet 1) Block 1

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
28 41 36 __	1. (11=TANK 1, 14=TANK 2L, 31=TANK 3, 34=TANK 2R) indicator disagrees with opposite indicator. TOTAL FUEL disagrees with indicator.
	2. 28-41-00 Fig. 103 (Sheet 1) Block 1
28 41 37 __	1. (11=TANK 1, 14=TANK 2L, 31=TANK 3, 34=TANK 2R) at (high stop, low stop, almost zero), TOTAL FUEL is OK.
	2. 28-41-00 Fig. 103 (Sheet 1) Block 1
28 41 38 __	1. (11=TANK 1, 14=TANK 2L, 31=TANK 3, 34=TANK 2R) indicator is (erratic, unreliable). TOTAL FUEL is OK.
	2. 28-41-00 Fig. 103 (Sheet 1) Block 8
28 41 39 __	1. (11=TANK 1, 14=TANK 2L, 31=TANK 3, 34=TANK 2R) indicator and TOTAL FUEL are (erratic, unreliable).
	2. 28-41-00 Fig. 103 (Sheet 1) Block 8
28 41 40 __	1. (11=TANK 1, 14=TANK 2L, 31=TANK 3, 34=Tank 2R) indicator is (high or low) when compared with sight gage and wing indicator.
	2. 28-41-00 Fig. 103 (Sheet 1) Block 8
28 41 41 __	1. (11=TANK 1, 14=TANK 2L, 31=Tank 3, 34=TANK 2R) indicator digital readout and pointer disagree.
	2. 28-41-00 Fig. 103 (Sheet 1) Block 1
28 41 42 __	1. (11=TANK 1, 14=TANK 2L, 31=TANK 3, 34=TANK 2R) indicator did not read inboard tank quantity with switchlight in.
	2. 28-41-00 Fig. 104 Block 7 (001-024, 027) 28-41-00 Fig. 104 Block 8 (025, 026, 028-033)

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
28 41 43 __	1. (11=TANK 1, 14=TANK 2L, 31=TANK 3, 34=TANK 2R) indicator did not change with quantity switchlight out. 2. 28-41-00 Fig. 104 Block 7 (001-024, 027) 28-41-00 Fig. 104 Block 8 (025, 026, 028-033)
28 41 44 __	1. (11=TANK 1, 14=TANK 2L, 31=TANK 3, 34=TANK 2R) indicator disagrees with opposite indicator. FUEL USED does not confirm TOTAL FUEL with switchlight out. OK with switchlight in. 2. 28-41-00 Fig. 103 (Sheet 2) Block 1
28 41 45 __	1. (11=TANK 1, 14=TANK 2L, 31=TANK 3, 34=TANK 2R) indicator disagrees with opposite indicator. FUEL USED does not confirm TOTAL FUEL. Indicator OK when tested. 2. 28-41-00 Fig. 103 (Sheet 2) Block 1
28 41 46 __	1. (11=TANK 1, 14=TANK 2L, 31=TANK 3, 34=TANK 2R) indicator disagrees with opposite indicator. FUEL USED does not confirm TOTAL FUEL. Indicator not OK when tested. 2. 28-41-00 Fig. 103 (Sheet 1) Block 1
28 41 47 __	1. (11=TANK 1, 14=TANK 2L, 31=TANK 3, 34=TANK 2R) indicator disagrees with opposite indicator. FUEL USED does not confirm TOTAL FUEL. Indicator does not test. 2. 28-41-00 Fig. 103 (Sheet 1) Block 8
28 41 48 __	1. (21=TANK 1A, 23=TANK 3A) QTY light on with switchlight out. 2. 28-41-00 Fig. 105 Block 6

FAULT CODE INDEX
TABLE 1

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
28 41 49 __	1. (21=TANK 1A, 23=TANK 3A) QTY light off with switchlight in. 2. 28-41-00 Fig. 105 Block 5

R

FUEL SYSTEM - DESCRIPTION AND OPERATION

R 1. General

R Fuel is contained in four integral fuel tanks identified as tank
R No. 1, 2L, 2R, and 3 (Ref. Fig. 1). Tanks 2L and 2R consist of
R two compartments separated by the outer wing station 126.60 rib
R structure. The two compartments are interconnected by high and
R low-level fuel transfer manifolds. Tanks 1 and 3 are enclosed
R by the wing root and inner wing station 477.70 rib structures.
R Provisions are included for fuel tank venting, engine feed and
R crossfeed, pressure fueling and pump defueling, tank sump
R scavenging, and auxiliary power unit (APU) fuel supply.

R Fuel is delivered to the engines by electrically powered dual
R boost pumps controlled by switchlights on the Flight
R Engineer/Second Officers FUEL SYSTEM panel (Ref. Fig. 2 and 3).
R Normally, tank 1 supplies fuel to the No. 1 engine, tanks 2L and
R 2R supply the No. 2 engine, and tank 3 supplies the No. 3
R engine. Fuel can also be supplied from any tank to the other
R engines through crossfeed valves.

R Electrically operated fuel shutoff valves permit the flight crew
R to isolate the fuel distribution system from each of the engine
R fuel feed lines. Fuel for operating the APU is taken from a
R fitting tapped into the No. 2 engine fuel feed line.

R Pressure fueling (and defueling) is accomplished at two
R underwing fueling stations (Ref. Fig. 4). Each station is
R equipped with two fueling/defueling hose adapters.

R A fueling/defueling control panel is located at the right wing
R fueling station. The panel supports the fuel quantity
R indicators, fueling and defueling valve control switches, and
R valve position lights used during fueling and defueling the
R aircraft. All tanks can be filled either, separately or
R simultaneously, using the switches and fuel quantity indicators
R on this panel. Preselection of the amount of fuel desired in
R each tank can be made at the panel, with fueling flow
R automatically terminated at the selected quantity.

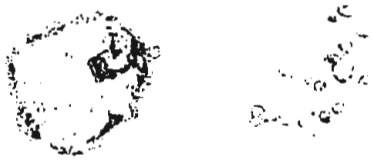
R The aircraft can also be fueled through two gravity fuel nozzle
R receptacles in each outer wing. Using this method, fuel is
R pumped into tanks 2L and 2R and then transferred to the other
R tanks. through the tank 2L and 2R pump defueling and respective
R tank fueling valves, using the aircraft boost pumps in tank 2L
R and 2R.

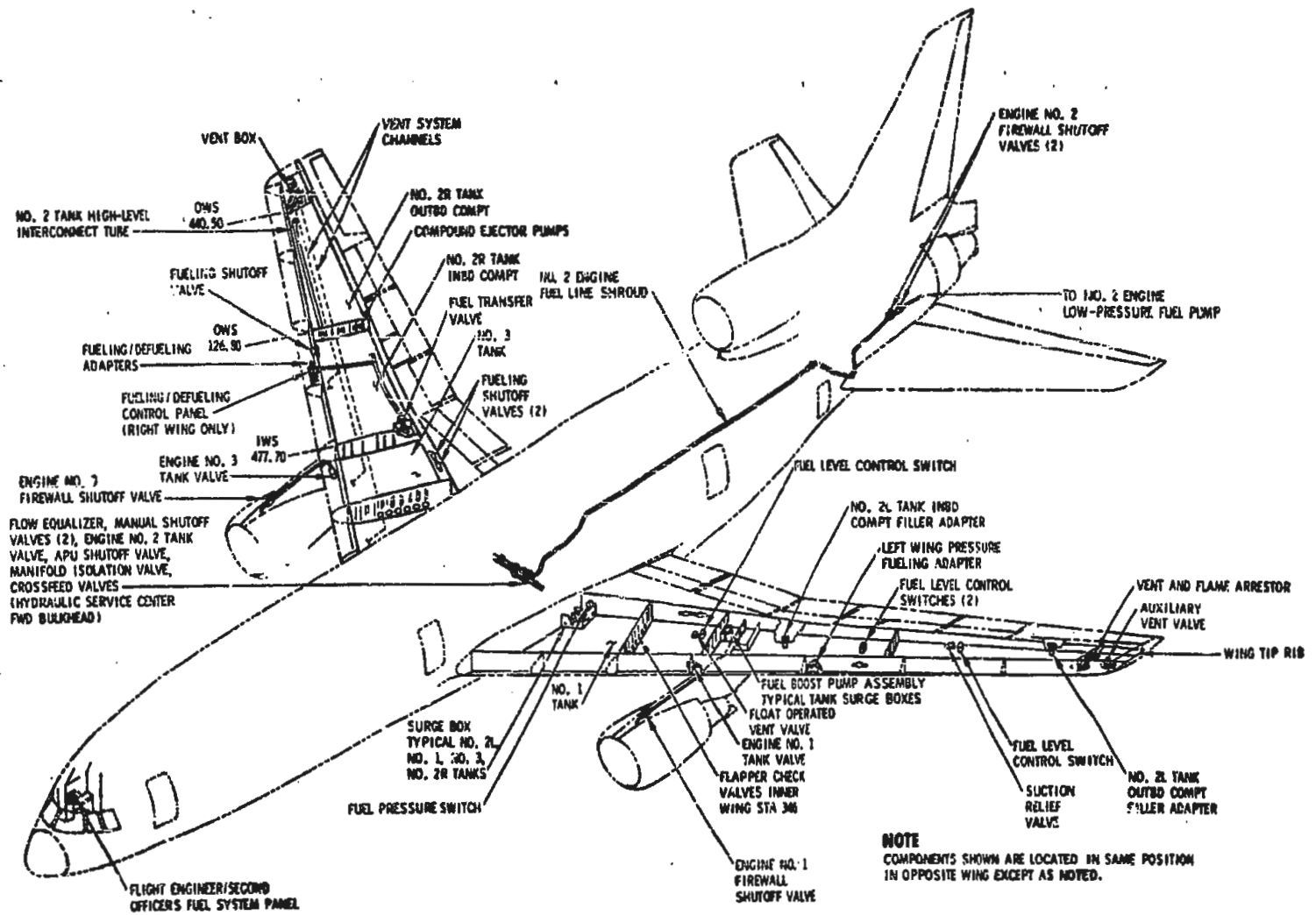
R Defueling can be accomplished by applying the fuel receiver pump
R suction to the fueling/defueling hose adapters and opening the

aircraft pump defueling valves. A greatly increased rate of defueling is obtained by augmenting the receiver pump suction with aircraft boost pump pressure. Ordinarily, with four hoses and a -10 psig pressure at the fueling/defueling adapters, R defueling can be accomplished at 334 gallons per minute. With aircraft boost pumps on, the defueling flow rate is increased to approximately 650 U.S. gallons (540 Imperial gallons) per minute.

Fuel jettisoning is accomplished by diverting a portion of each boost pump output into the fueling/defueling manifold through normally closed pump defuel valves (Ref. Fig. 2). This fuel flows through interconnecting manifolds to motor-operated jettison valves located well outboard in each wing trailing edge, where it is dumped overboard through jettison masts equipped with flame arrestors. The amount of fuel jettisoned is controllable by the Flight Engineer/Second Officer. The maximum amount that can be jettisoned, however, is limited by fuel level sensors in each tank that automatically terminate jettisoning at specific fuel tank levels.

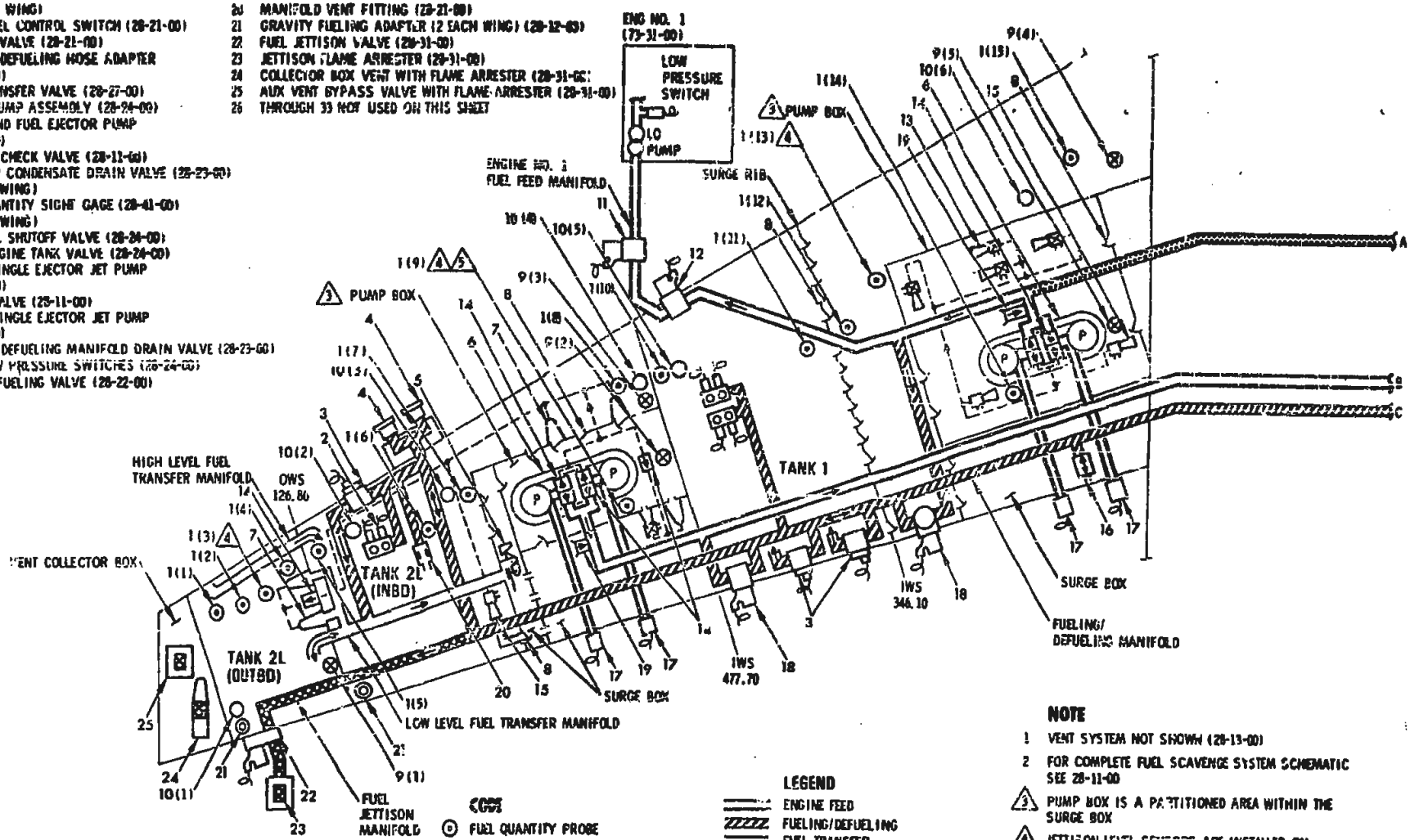
A full height compensated capacitance type fuel quantity measuring system displays fuel quantity on indicators located in the flight station and on the fueling/defueling panel. Additional fuel quantity indications are provided by manually extended magnetic-float operated dip sticks installed in the underside of each tank.




VENT BOX
VENT SYSTEM CHANNELS
NO. 2 TANK HIGH-LEVEL INTERCONNECT TUBE
OWS 440.50
NO. 2R TANK OUTBD COMPT
COMPOUND EJECTOR PUMPS
NO. 2R TANK INBD COMPT
FUELING SHUTOFF VALVE
FUEL TRANSFER VALVE
NO. 2 ENGINE FUEL LINE SHROUD
TO NO. 2 ENGINE LOW-PRESSURE FUEL PUMP
OWS 126.80
FUELING/DEFUELING ADAPTERS
NO. 3 TANK
FUELING/DEFUELING CONTROL PANEL (RIGHT WING ONLY)
FUELING SHUTOFF VALVES (2)
IWS 477.70
ENGINE NO. 3 TANK VALVE
ENGINE NO. 3 FIREWALL SHUTOFF VALVE
FLOW EQUALIZER, MANUAL SHUTOFF VALVES (2), ENGINE NO. 2 TANK VALVE, APU SHUTOFF VALVE, MANIFOLD ISOLATION VALVE, CROSSFEED VALVES (HYDRAULIC SERVICE CENTER FWD BULKHEAD)
FUEL LEVEL CONTROL SWITCH
NO. 2L TANK INBD COMPT FILLER ADAPTER
LEFT WING PRESSURE FUELING ADAPTER
FUEL LEVEL CONTROL SWITCHES (2)
VENT AND FLAME ARRESTOR
AUXILIARY VENT VALVE
WING TIP RIB
FUEL BOOST PUMP ASSEMBLY
TYPICAL TANK SURGE BOXES
NO. 1 TANK
FLOAT OPERATED VENT VALVE
ENGINE NO. 1 TANK VALVE
SURGE BOX TYPICAL NO. 2L, NO. 1, NO. 3, NO. 2R TANKS
FLAPPER CHECK VALVES INNER WING STA 346
FUEL PRESSURE SWITCH
FUEL LEVEL CONTROL SWITCH
SUCTION RELIEF VALVE
NO. 2L TANK OUTBD COMPT FILLER ADAPTER
ENGINE NO. 1 FIREWALL SHUTOFF VALVE
FLIGHT ENGINEER/SECOND OFFICERS FUEL SYSTEM PANEL
NOTE
COMPONENTS SHOWN ARE LOCATED IN SAME POSITION IN OPPOSITE WING EXCEPT AS NOTED.
M1-0000-28-1668

Aircraft Fuel System
Figure 1

1 FUEL QUANTITY PROBE (28-41-00) (19 EACH WING)
2 FUEL LEVEL CONTROL SWITCH (28-21-00)
3 FUELING VALVE (28-21-00)
4 FUELING/DEFUELING HOSE ADAPTER (28-21-00)
5 FUEL TRANSFER VALVE (28-27-00)
6 BOOST PUMP ASSEMBLY (28-24-00)
7 COMPOUND FUEL EJECTOR PUMP (28-24-00)
8 FLAPPER CHECK VALVE (28-11-00)
9 FUEL AND CONDENSATE DRAIN VALVE (28-23-00) (5 EACH WING)
10 FUEL QUANTITY SIGHT GAGE (28-41-00) (6 EACH WING)
11 FIREWALL SHUTOFF VALVE (28-24-00)
12 WING ENGINE TANK VALVE (28-24-00)
13 LARGE SINGLE EJECTOR JET PUMP (28-24-00)
14 CHECK VALVE (28-11-00)
15 SMALL SINGLE EJECTOR JET PUMP (28-11-00)
16 FUELING/DEFUELING MANIFOLD DRAIN VALVE (28-23-00)
17 FUEL LOW PRESSURE SWITCHES (28-24-00)
18 TANK DEFUELING VALVE (28-22-00)
19 BOOST PUMP SUCTION BYPASS VALVE (28-24-00)
20 MANIFOLD VENT FITTING (28-21-00)
21 GRAVITY FUELING ADAPTER (2 EACH WING) (28-12-00)
22 FUEL JETTISON VALVE (28-31-00)
23 JETTISON FLAME ARRESTER (28-31-00)
24 COLLECTOR BOX VENT WITH FLAME ARRESTER (28-31-00)
25 AUX VENT BYPASS VALVE WITH FLAME ARRESTER (28-31-00)
26 THROUGH 33 NOT USED ON THIS SHEET



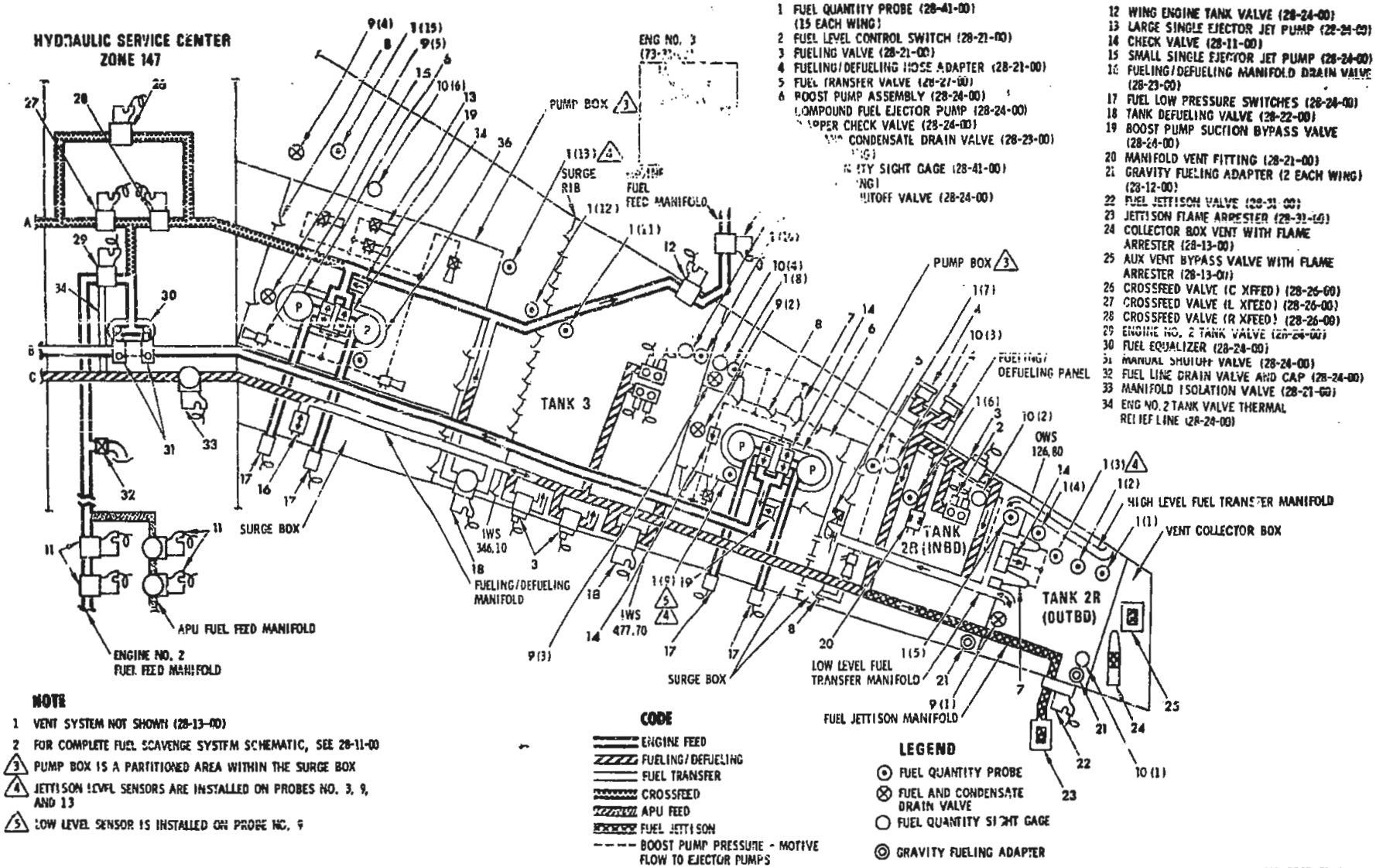
NOTE

1. VENT SYSTEM NOT SHOWN (28-13-00)
2. FOR COMPLETE FUEL SCAVENGE SYSTEM SCHEMATIC SEE 28-11-00
3. PUMP BOX IS A PARTITIONED AREA WITHIN THE SURGE BOX
4. JETTISON LEVEL SENSORS ARE INSTALLED ON PROBES NO. 3, 9, AND 13
5. LOW LEVEL SENSOR IS INSTALLED ON PROBE NO. 9

M1-0002-28-694

R Fuel System Diagram
R Figure 2 (Sheet 1)

EFFECTIVITY: 001-024, 027



1 FUEL QUANTITY PROBE (28-41-00) (15 EACH WING)
2 FUEL LEVEL CONTROL SWITCH (28-21-00)
3 FUELING VALVE (28-21-00)
4 FUELING/DEFUELING HOSE ADAPTER (28-21-00)
5 FUEL TRANSFER VALVE (28-27-00)
6 BOOST PUMP ASSEMBLY (28-24-00)
COMPOUND FUEL EJECTOR PUMP (28-24-00)
UPPER CHECK VALVE (28-24-00)
CONDENSATE DRAIN VALVE (28-23-00) (4 EACH WING)
QUANTITY SIGHT GAGE (28-41-00) (2 EACH WING)
SHUTOFF VALVE (28-24-00)

12 WING ENGINE TANK VALVE (28-24-00)
13 LARGE SINGLE EJECTOR JET PUMP (28-24-00)
14 CHECK VALVE (28-11-00)
15 SMALL SINGLE EJECTOR JET PUMP (28-24-00)
16 FUELING/DEFUELING MANIFOLD DRAIN VALVE (28-23-00)
17 FUEL LOW PRESSURE SWITCHES (28-24-00)
18 TANK DEFUELING VALVE (28-22-00)
19 BOOST PUMP SUCTION BYPASS VALVE (28-24-00)
20 MANIFOLD VENT FITTING (28-21-00)
21 GRAVITY FUELING ADAPTER (2 EACH WING) (28-12-00)
22 FUEL JETTISON VALVE (28-31-00)
23 JETTISON FLAME ARRESTER (28-31-00)
24 COLLECTOR BOX VENT WITH FLAME ARRESTER (28-13-00)
25 AUX VENT BYPASS VALVE WITH FLAME ARRESTER (28-13-00)
26 CROSSFEED VALVE (C XFEED) (28-26-00)
27 CROSSFEED VALVE (L XFEED) (28-26-00)
28 CROSSFEED VALVE (R XFEED) (28-26-00)
29 ENGINE NO. 2 TANK VALVE (28-24-00)
30 FUEL EQUALIZER (28-24-00)
31 MANUAL SHUTOFF VALVE (28-24-00)
32 FUEL LINE DRAIN VALVE AND CAP (28-24-00)
33 MANIFOLD ISOLATION VALVE (28-21-00)
34 ENG NO. 2 TANK VALVE THERMAL RELIEF LINE (28-24-00)

NOTE

1 VENT SYSTEM NOT SHOWN (28-13-00)
2 FOR COMPLETE FUEL SCAVENGE SYSTEM SCHEMATIC, SEE 28-11-00
3 PUMP BOX IS A PARTITIONED AREA WITHIN THE SURGE BOX
4 JETTISON LEVEL SENSORS ARE INSTALLED ON PROBES NO. 3, 9, AND 13
5 LOW LEVEL SENSOR IS INSTALLED ON PROBE NO. 9

CODE

ENGINE FEED
FUELING/DEFUELING
FUEL TRANSFER
CROSSFEED
APU FEED
FUEL JETTISON
BOOST PUMP PRESSURE - MOTIVE FLOW TO EJECTOR PUMPS

LEGEND

FUEL QUANTITY PROBE
FUEL AND CONDENSATE DRAIN VALVE
FUEL QUANTITY SIGHT GAGE
GRAVITY FUELING ADAPTER

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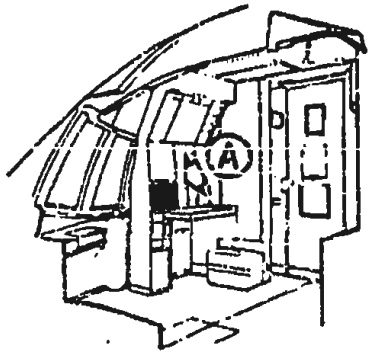
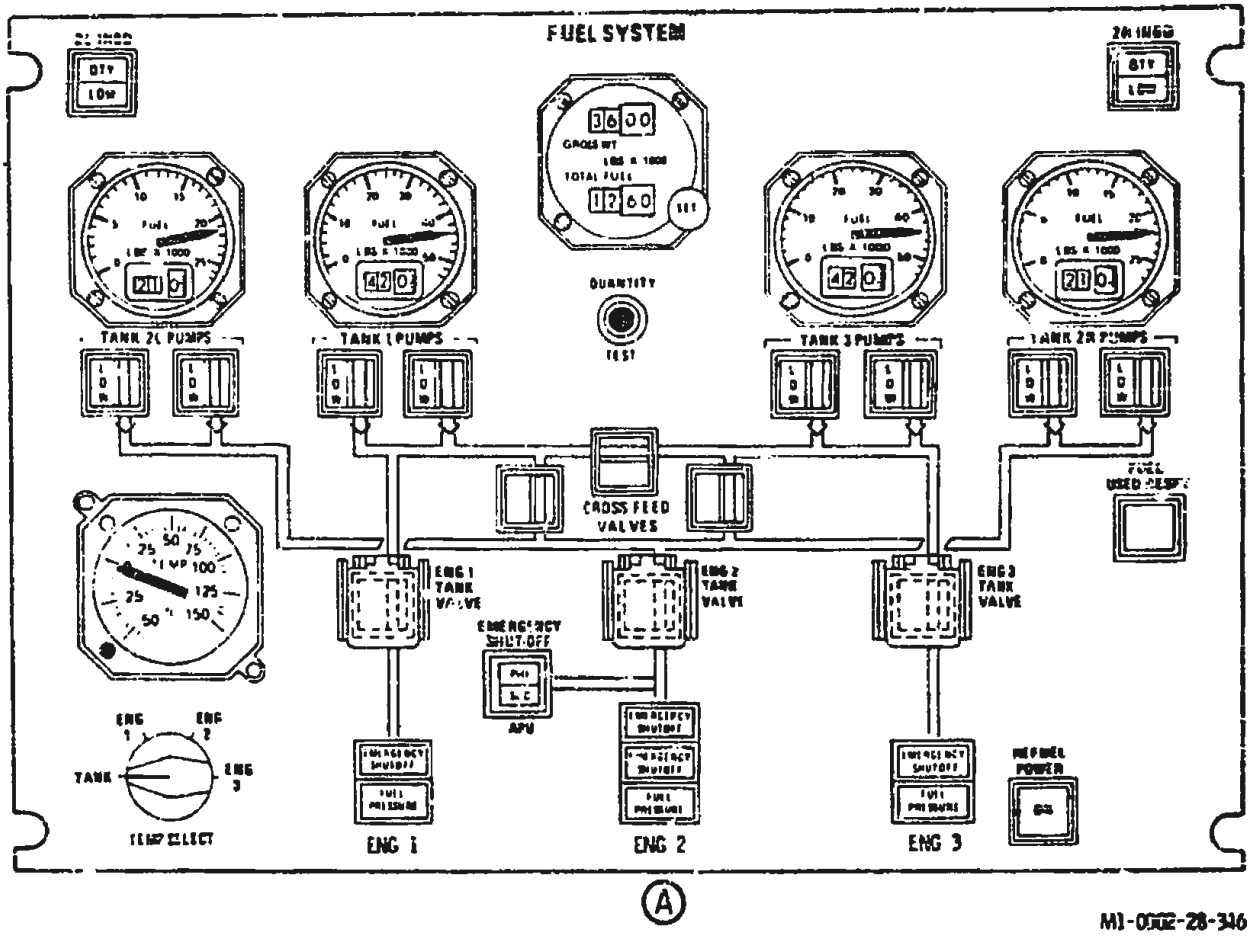
R Fuel System Diagram
R Figure 2 (Sheet 2)

EFFECTIVITY: 001-024, 027



FLIGHT ENGINEER/SECOUND OFFICERS STATION
ZONE 215



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Flight Engineer/Second Officers Fuel System Panel
Figure 3 (Sheet 1)

1 TANK 2L AND 2R (INBOARD FUEL QUANTITY SWITCHLIGHT

WHEN SWITCHLIGHT IS RELEASED (OUT), TANK 2L AND 2R FUEL QUANTITY INDICATORS SHOW TOTAL FUEL IN RESPECTIVE TANKS. WHEN DEPRESSED (LATCHED IN), TANK 2L AND 2R INDICATORS SHOW AMOUNT OF FUEL IN TANK 2L AND 2R INBOARD SECTIONS. THE QTY LEGEND IS ILLUMINATED WHEN THE SWITCHLIGHT IS DEPRESSED TO PROVIDE AN INDICATION OF SWITCH POSITION. THE LOW LEGEND IS ILLUMINATED BY A THERMISTOR CONTROLLED FUEL LEVEL SENSING CIRCUIT WHENEVER THE FUEL LEVEL IN THE BOOST PUMP SURGE BOX UNCOVERS THE THERMISTOR (APPROXIMATELY 700 POUNDS OF FUEL REMAINING). THE LOW LIGHT CIRCUIT IS TESTED BY DEPRESSING THE PUSH-TO-TEST SUMP LAMP ON THE 2L AND 2R SIGNAL CONDITIONERS LOCATED IN THE MESC

2 FUEL QUANTITY INDICATOR (4)

INDICATES THE WEIGHT OF FUEL IN RESPECTIVE TANKS 2L, 1, 3, AND 2R. DEPRESSING QUANTITY TEST SWITCH (ITEM 3) WILL DRIVE ALL INDICATOR POINTERS, AND FUEL TOTALIZER (ITEM 4) DIGITAL READOUT, UPSCALE TO TEST INDICATING CIRCUITS

3 QUANTITY TEST SWITCH

SWITCH IS HELD DEPRESSED TO TEST FUEL QUANTITY INDICATORS. ALL QUANTITY INDICATIONS WILL DRIVE UPSCALE AND THEN RETURN TO PREVIOUS INDICATION WHEN SWITCH IS RELEASED

4 FUEL TOTALIZER INDICATOR

PROVIDES DIGITAL READOUT OF TOTAL FUEL WEIGHT AND AIRCRAFT GROSS WEIGHT (AIRCRAFT ZERO FUEL WEIGHT PLUS TOTAL FUEL WEIGHT)

5 FUEL USED RESET SWITCH

MOMENTARILY DEPRESSING SWITCH RESETS FUEL USED INDICATORS ON ENGINE FUEL PANEL

6 REFUEL POWER SWITCHLIGHT

PROVIDES THE FE/SO WITH THE CAPABILITY OF RELEASING THE SOLENOID HELD SYSTEM POWER SWITCH ON THE REFUEL/DEFUELING PANEL AND THEREBY DEACTIVATING THE REFUEL/DEFUELING SYSTEMS. THE SWITCHLIGHT ON LEGEND, WHEN ILLUMINATED, INDICATES THAT THE REFUEL/DEFUELING PANEL IS POWERED. THE OFF LIGHT GOES OUT WHEN THE SYSTEM POWER SWITCH RELEASES TO THE OFF POSITION

7 CROSS VALVES SWITCHLIGHTS (3)

WHEN SWITCHLIGHTS ARE DEPRESSED (LATCHED IN), RESPECTIVE FUEL SYSTEM (LX FEED, CX FEED, RX FEED) CROSSFEED VALVES OPEN. ILLUMINATED BAR LIGHT INDICATES SWITCH IS IN VALVE OPEN POSITION. BLUE DISAGREEMENT LIGHT IS MOMENTARILY ON WHEN VALVE IS IN-TRANSIT TO OPEN OR CLOSE POSITION AND STAYS ON IF VALVE POSITION DOES NOT AGREE WITH SWITCHLIGHT POSITION

8 TANK VALVE SWITCHLIGHTS (3)

WHEN ENG 1, ENG 2, AND ENG 3 TANK VALVE SWITCHLIGHTS ARE DEPRESSED (LATCHED IN), RESPECTIVE FUEL FEED SYS... A TANK VALVES OPEN. BAR LIGHT ON INDICATES SWITCHLIGHT IS IN OPEN POSITION. BLUE DISAGREEMENT LIGHT COMES ON AT NOTED IN ITEM 7

NOTE

BAR LIGHTS IN ENG 1 AND ENG 3 SWITCHLIGHTS WILL GO OUT IF TANK VALVE IS CLOSED BY ACTUATION OF RESPECTIVE ENGINE FIRE-PULL HANDLE. ENG 2 TANK VALVE IS NOT AFFECTED BY FIRE-PULL HANDLE

9 EMERGENCY SHUTOFF LIGHTS (4)

LIGHT COMES ON ONLY WHEN RESPECTIVE FIREWALL SHUTOFF VALVE IS IN-TRANSIT TO CLOSED OR OPEN POSITION. FIREWALL SHUTOFF VALVES ARE OPERATED BY RESPECTIVE ENGINE FIRE-PULL HANDLES

10 ENGINE FUEL PRESSURE LIGHT (3)

LIGHT INDICATES LOW OUTPUT FROM ENGINE LOW PRESSURE PUMP

11 APU EMERGENCY SHUTDOWN LIGHTS

PRI AND SEC LIGHTS COME ON ONLY WHEN APU PRIMARY AND SECONDARY FIREWALL SHUTOFF VALVES ARE IN-TRANSIT TO OPEN AND CLOSED POSITIONS. A STEADY LIGHT INDICATES THAT SHUTOFF VALVE POSITION DOES NOT AGREE WITH POSITION OF APU FIRE-PULL HANDLE

12 FUEL TEMPERATURE SELECTOR SWITCH

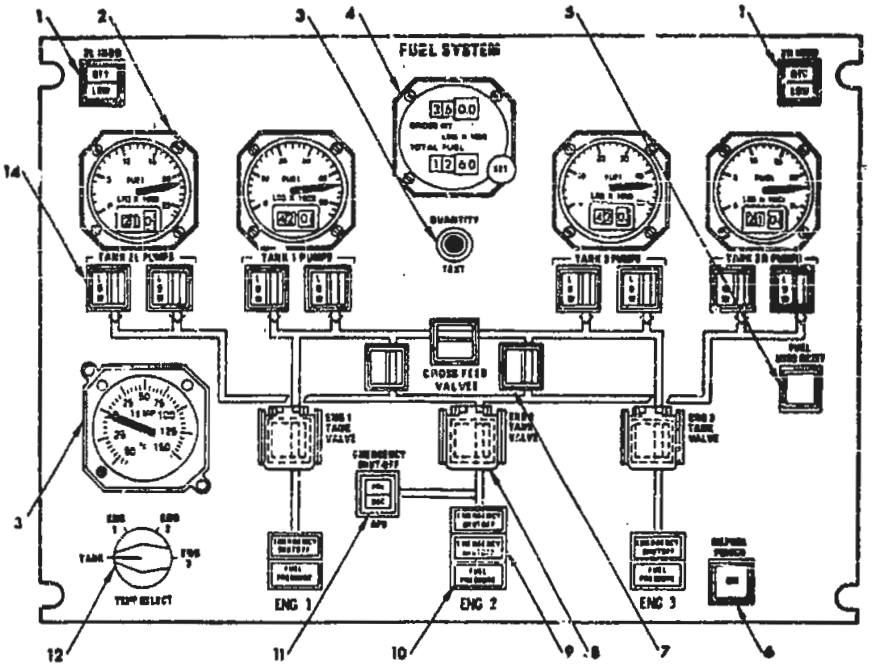
SELECTS TANK 2L OR ENGINE 1, 2, OR 3 FUEL CONTROL INLET TEMPERATURE FOR DISPLAY ON TEMPERATURE INDICATOR

13 FUEL TEMPERATURE INDICATOR

INDICATES TEMPERATURE SELECTED BY TEMP SEL SWITCH.

14 TANK 2R, 1, 3, AND 2L BOOST PUMP SWITCHLIGHTS (8)

WHEN DEPRESSED (LATCHED IN), SWITCHLIGHT TURNS ON RESPECTIVE TANK BOOST PUMP. BAR LIGHT COMES ON TO INDICATE SWITCHLIGHT POSITION. LOW LEGEND, WHEN ILLUMINATED, INDICATES PUMP OUTPUT PRESSURE IS 6(± 1) PSIG OR LOWER



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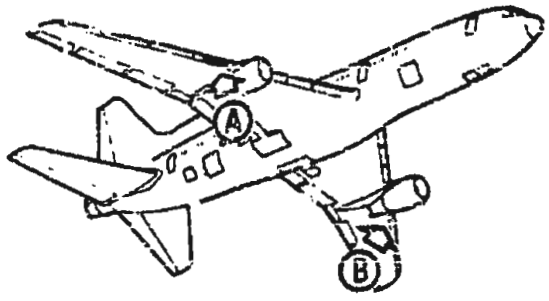
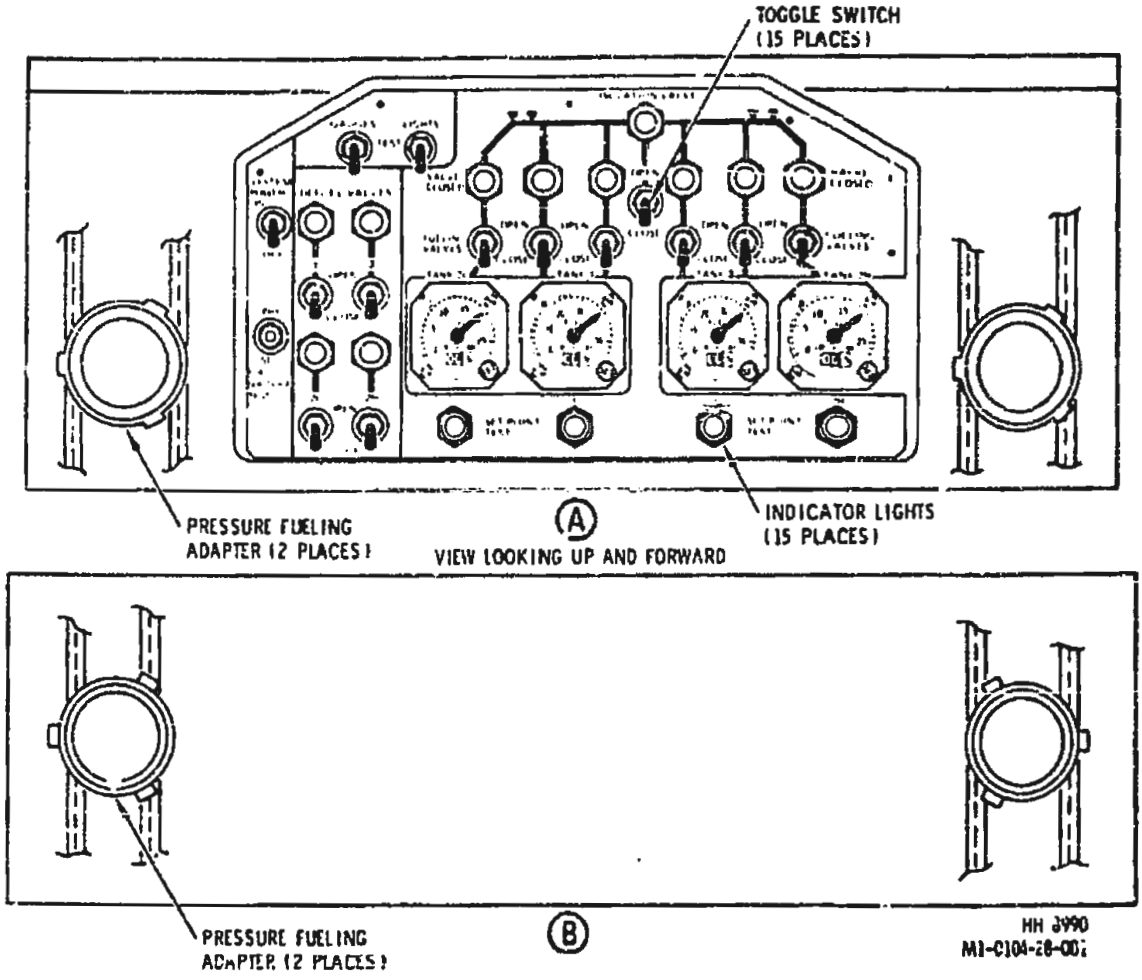
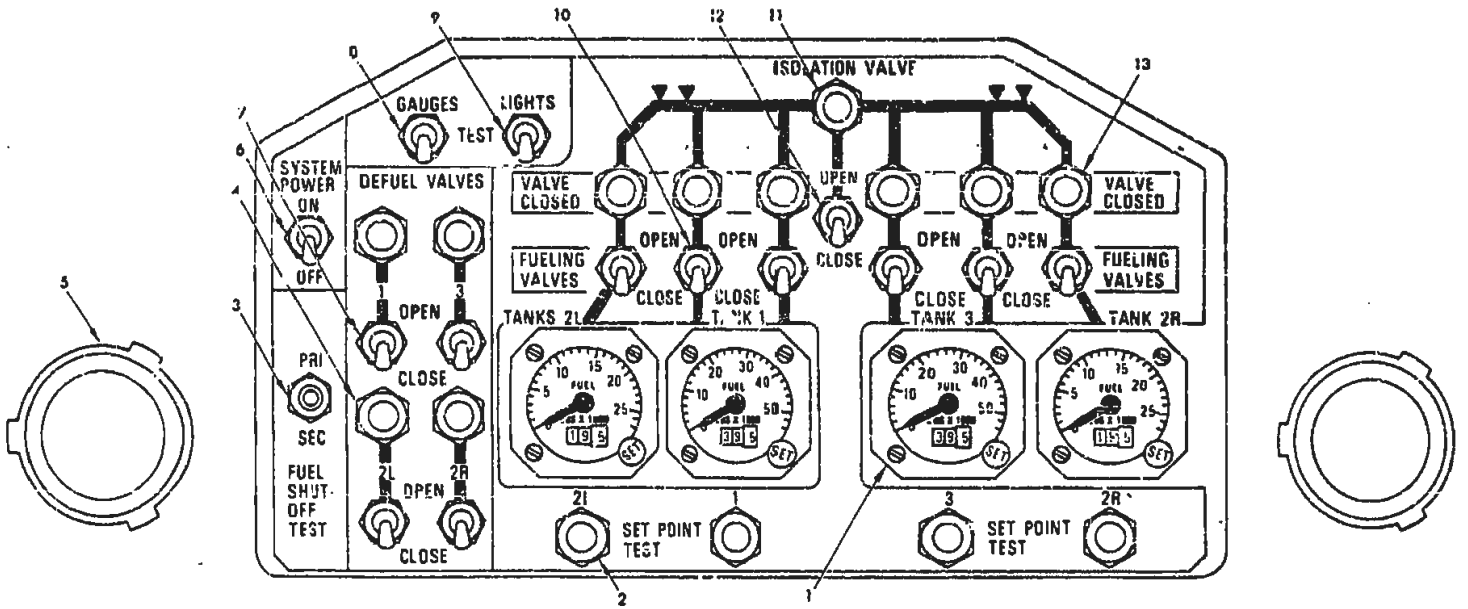
Flight Engineer/Second Officers Fuel System Panel
Figure 3 (Sheet 2)





Fueling/Defueling Panel
Figure 4 (Sheet 1)



1 FUEL QUANTITY INDICATOR (4 PLACES)

- PROVIDES DIGITAL AND ANALOG INDICATION OF FUEL QUANTITY
- INCORPORATES SET POINT INDEX TO PERMIT SELECTION OF DESIRED FUEL QUANTITY. REFUELING IS AUTOMATICALLY TERMINATED WHEN INDICATOR POINTER REACHES INDEX SETTING. TERMINATION OF FUEL FLOW INTO TANK IS INDICATED WHEN CORRESPONDING SET POINT TEST LIGHT GOES OUT AND VALVE CLOSED LIGHT(S) COMES ON

2 SET POINT TEST LIGHT (4 PLACES)

- PROVIDES INDICATION OF AUTOMATIC SHUTOFF OF REFUELING FLOW. LIGHT GOES OUT WHEN INDICATOR POINTER PASSES SET POINT INDEX

3 FUEL SHUTOFF TEST SWITCH

- SWITCH IS DOUBLE-POLE DOUBLE-THROW MOMENTARY CONTACT TYPE WITH CENTER OFF POSITION
- PRIMARY AND SECONDARY POSITIONS SIMULATE FULL TANK CONDITION TO TEST AUTOMATIC FUEL SHUTOFF OPERATION. THE TEST VERIFIES OPERATION OF THE PRIMARY AND SECONDARY PILOT VALVES IN THE FUELING VALVES AND PRIMARY AND SECONDARY SWITCHES IN THE CORRESPONDING FUEL LEVEL CONTROL SWITCHES
- PROPER TEST RESULT IS INDICATED BY ALL VALVE CLOSED LIGHTS COMING ON

4 DEFUEL VALVES LIGHT (4 PLACES)

- LIGHT NORMALLY BLINKS ON, THEN OFF, WHEN VALVE IS IN-TRANSIT TO OPEN OR CLOSED POSITION. IF ON STEADY, VALVE IS NOT IN AGREEMENT WITH SWITCH POSITION

5 REFUEL/DEFUELING NOZZLE ADAPTER (2 PLACES)

- INCORPORATES PROVISIONS FOR ATTACHING STANDARD FUEL HOSE NOZZLES. TWO ADAPTERS ALSO LOCATED IN LEFT WING
- NOZZLE ATTACHMENT FLANGE IS DESIGNED TO BREAKAWAY IF PRE-DETERMINED CRITICAL FORCE IS APPLIED TO ADAPTERS THROUGH FUELING HOSES
- BROKEN NOZZLE ATTACHMENT FLANGES CAN BE REPLACED WITHOUT DISASSEMBLY. INTERNAL SPRING LOADED POPPET CLOSES ADAPTER PORT
- TWO REFUEL/DEFUELING NOZZLE ADAPTERS ARE ALSO LOCATED IN LEFT WING LEADING EDGE, ZONE 621 FB

6 SYSTEM POWER SWITCH

- CONTROLS APPLICATION OF ELECTRICAL POWER TO REFUEL/DEFUELING SYSTEM
- WHEN THE SWITCH IS ELECTRICALLY LATCHED IN ON POSITION, SERVICE PANEL LIGHTS COME ON, FUEL QUANTITY INDICATORS ARE POWERED, FUEL SHUTOFF TEST CIRCUIT IS ARMED, VALVE CLOSED INDICATOR LIGHTS COME ON, AND REFUEL POWER SWITCHLIGHT ON FLIGHT ENGINEER/SECOND OFFICERS FUEL SYSTEM PANEL COMES ON
- IF INADVERTENTLY LEFT ON, SYSTEM POWER SWITCH CAN BE UNLATCHED TO OFF POSITION BY DEPRESSING REFUEL POWER SWITCHLIGHT

7 DEFUEL VALVES SWITCH (4 PLACES)

- OPENS OR CLOSES DEFUELING VALVES

8 GAUGES TEST SWITCH

- WHEN HELD IN POSITION, SWITCH CHECKS OPERATION OF FUEL QUANTITY INDICATORS
- ALL FUEL QUANTITY INDICATORS DRIVE FULL UPSCALE
- CORRESPONDING SET POINT LIGHTS GO OUT
- ANY FUELING VALVE THAT IS OPEN WILL CLOSE
- SWITCH OPERATES IN PARALLEL WITH QTY TEST SWITCH ON FLIGHT ENGINEER/SECOND OFFICERS FUEL SYSTEM PANEL

9 INDICATOR LIGHTS TEST SWITCH

- TEST ON PANEL INDICATOR LIGHTS. ANY LIGHT NOT ALREADY ON WILL COME ON WHEN SWITCH IS HELD IN TEST POSITION

10 FUELING VALVE CONTROL SWITCH (6 PLACES)

- ARMS FUELING VALVE CIRCUIT FOR OPEN OPERATION
- FUEL PRESSURE IS REQUIRED TO OPEN FUELING VALVE

11 ISOLATION VALVE LIGHT

- LIGHT NORMALLY BLINKS ON, THEN OFF. WHEN VALVE IS IN-TRANSIT TO OPEN OR CLOSED POSITION. IF ON STEADY, VALVE IS NOT IN AGREEMENT WITH SWITCH POSITION

12 ISOLATION VALVE SWITCH

- OPENS REFUEL/DEFUELING MANIFOLD ISOLATION VALVE TO PERMIT REFUEL/DEFUELING OF ALL TANKS THROUGH ADAPTERS IN ONE WING ONLY
- PERMITS CROSS SHIP TRANSFER OF FUEL BY MAINTENANCE PERSONNEL

13 FUELING VALVE POSITION LIGHT (6 PLACES)

- LIGHT IS ON WHEN CORRESPONDING FUELING VALVE IS CLOSED

M1-0005-28-160

Fueling/Defueling Panel
Figure 4 (Sheet 2)

FUEL SYSTEM - DESCRIPTION AND OPERATION

1. General

Fuel is contained in six integral fuel tanks identified as tank No. 1, 1A, 2L, 2R, 3, and 3A (Ref. Fig. 1). Tanks 2L and 2R consist of two compartments separated by the outer wing station 126.80 rib structure. The two compartments are interconnected by high and low-level fuel transfer manifolds. Tanks 1 and 3 are enclosed by the wing root and inner wing station 477.70 rib structures. Tanks 1A and 3A are enclosed by the wing center section box beams at fuselage stations 1103 and 1163, and separated by a partition at fuselage station FBL-0. Provisions are included for fuel tank venting, engine feed and crossfeed, pressure fueling and pump defueling, fuel jettison, tank sump scavenging, and auxiliary power unit (APU) fuel supply.

Fuel is delivered to the engines by electrically powered dual boost pumps controlled by switchlights on the Flight Engineer/Second Officers FUEL SYSTEM panel (Ref. Fig. 2 and 3). Normally, tank 1 supplies fuel to the No. 1 engine, tanks 2L and 2R supply the No. 2 engine, and tank 3 supplies the No. 3 engine. Fuel can also be supplied from any wing tank to the other engines through crossfeed valves. Fuel in tanks 1A and 3A is normally transferred to replenish fuel used from tanks 1 and 3 by jet ejector scavenge pumps operated by motive fuel flow from the tank 1 and 3 fuel boost pumps.

Electrically operated fuel shutoff valves permit the flight crew to isolate the fuel distribution system from each of the engine fuel feed lines. Fuel for operating the APU is taken from a fitting tapped into the No. 2 engine fuel feed line.

Pressure fueling (and defueling) is accomplished at two underwing fueling stations (Ref. Fig. 4). Each station is equipped with two fueling/defueling hose adapters.

A fueling/defueling control panel is located at the right wing fueling station. The panel supports the fuel quantity indicators, fueling and defueling valve control switches, and valve position lights used during fueling and defueling the aircraft. All tanks can be filled either, separately or simultaneously, using the switches and fuel quantity indicators on this panel. Preselection of the amount of fuel desired in each tank can be made at the panel, with fueling flow automatically terminated at the selected quantity.

The aircraft can also be fueled through two gravity fuel nozzle receptacles in each outer wing. Using this method, fuel is pumped into tanks 2L and 2R and then transferred to the other

tanks, through the tank 2L and 2R pump defueling and respective tank fueling valves, using the aircraft boost pumps in tank 2L and 2R.

Defueling can be accomplished by applying the fuel receiver pump suction to the fueling/defueling hose adapters and opening the aircraft pump defueling valves. A greatly increased rate of defueling is obtained by augmenting the receiver pump suction with aircraft boost pump pressure. Ordinarily, with four hoses and a -10 psig pressure at the fueling/defueling adapters, defueling can be accomplished at 200 gallons per minute. With aircraft boost pumps on, the defueling flow rate is increased to approximately 650 U.S. gallons (540 Imperial gallons) per minute.

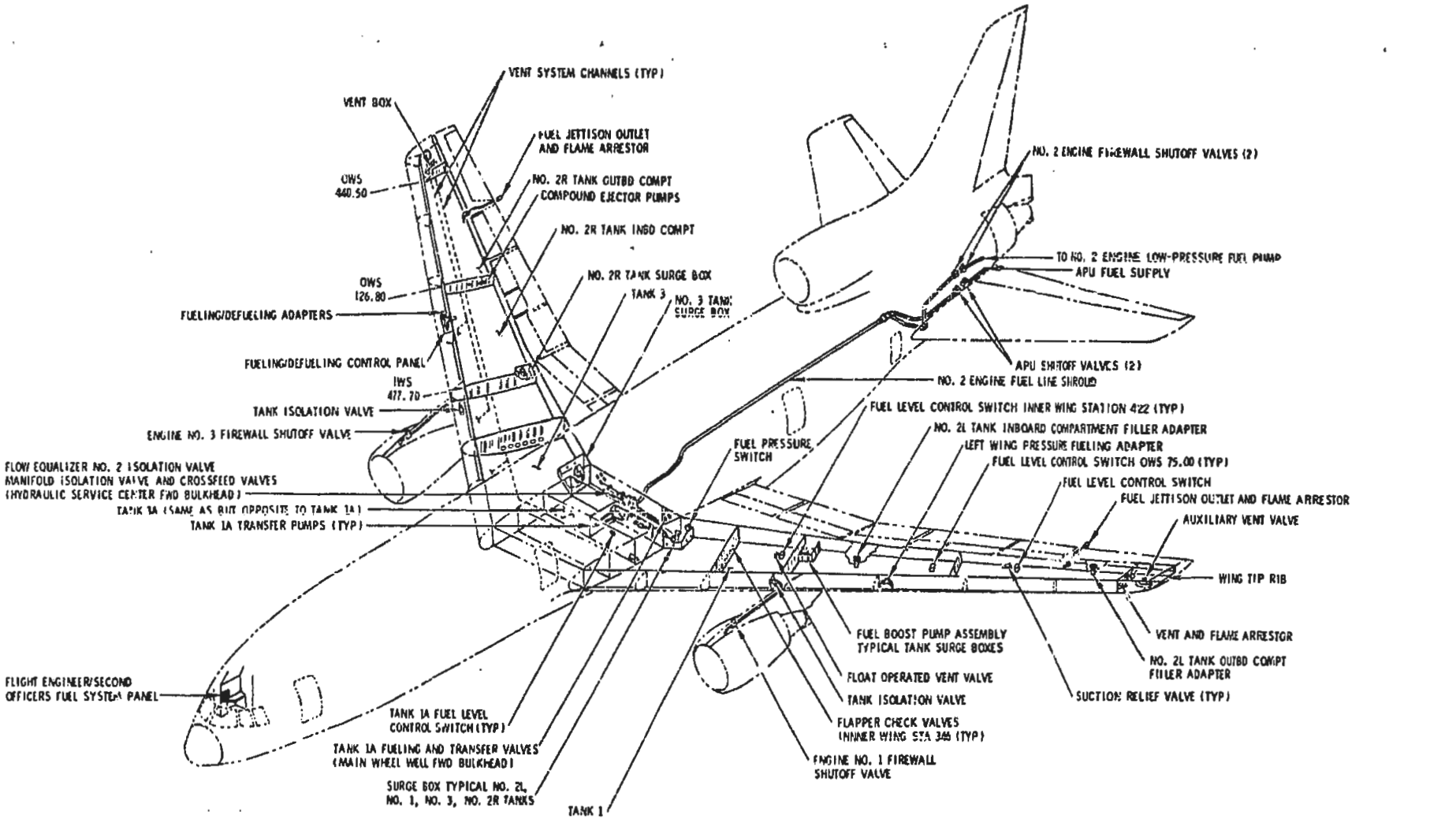
R Fuel transfer from center section tanks 1A and 3A to wing tanks
R 1 and 3 is effected by three large (single nozzle) jet ejector
R scavenge pumps in each center section tank. Motive fuel flow
R for ejector pump operation is derived from the respective tank 1
R and 3 fuel boost pumps through electrically actuated fuel
R transfer valves. Fuel transfer is initiated by latching in the
R appropriate transfer switchlight on the FE/SO FUEL SYSTEM panel.
R Actual transfer of fuel is controlled by high fuel level sensing
R thermistors in tank 1 and 3 and fuel quantity signal
R conditioners, in response to the fuel levels sensed by the
R thermistors.

R An alternate method of transferring fuel from tanks 1A and 3A to
R tanks 1 and 3 is through the gravity fuel transfer system. A
R gravity flow control valve in each center section tank is
R electrically opened by latching in the appropriate tank 1A or
R tank 3A GRAVITY TRANSFER switchlight on the FE/SO FUEL SYSTEM
R Panel. When opened, the valve establishes a direct path for
R fuel to flow into the adjacent 1 or 3 wing tank.

Fuel jettisoning is accomplished by diverting a portion of each boost pump output into the fueling/defueling manifold through normally closed pump defuel valves (Ref. Fig. 2). This fuel flows through interconnecting manifolds to motor-operated jettison valves located well outboard in each wing trailing edge, where it is dumped overboard through jettison masts equipped with flame arrestors. The amount of fuel jettisoned is controllable by the Flight Engineer/Second Officers. The maximum amount that can be jettisoned, however, is limited by fuel level sensors in each tank that automatically terminate jettisoning at specific fuel tank levels.

A full height compensated capacitance type fuel quantity measuring system displays fuel quantity on indicators located in the flight station and on the fueling/defueling panel. Additional fuel quantity indications are provided by manually

extended magnetic-float operated dip sticks installed in the underside of each tank.


VENT SYSTEM CHANNELS (TYP)
VENT BOX
FUEL JETTISON OUTLET AND FLAME ARRESTOR
OWS 440.50
NO. 2R TANK OUTBD COMPT COMPOUND EJECTOR PUMPS
NO. 2R TANK INBD COMPT
NO. 2R TANK SURGE BOX
TANK 3
NO. 3 TANK SURGE BOX
OWS 126.80
FUELING/DEFUELING ADAPTERS
FUELING/DEFUELING CONTROL PANEL
IWS 477.70
TANK ISOLATION VALVE
ENGINE NO. 3 FIREWALL SHUTOFF VALVE
FLOW EQUALIZER NO. 2 ISOLATION VALVE
MANIFOLD ISOLATION VALVE AND CROSSFEED VALVES
(HYDRAULIC SERVICE CENTER FWD BULKHEAD)
TANK 1A (SAME AS BUT OPPOSITE TO TANK 1A)
TANK 1A TRANSFER PUMPS (TYP)
FLIGHT ENGINEER/SECOND OFFICERS FUEL SYSTEM PANEL
TANK 1A FUEL LEVEL CONTROL SWITCH (TYP)
TANK 1A FUELING AND TRANSFER VALVES (MAIN WHEEL WELL FWD BULKHEAD)
SURGE BOX TYPICAL NO. 2L, NO. 1, NO. 3, NO. 2R TANKS
TANK 1
NO. 2 ENGINE FIREWALL SHUTOFF VALVES (2)
TO NO. 2 ENGINE LOW-PRESSURE FUEL PUMP
APU FUEL SUPPLY
APU SHUTOFF VALVES (2)
NO. 2 ENGINE FUEL LINE SHROUD
FUEL LEVEL CONTROL SWITCH INNER WING STATION 422 (TYP)
NO. 2L TANK INBOARD COMPARTMENT FILLER ADAPTER
LEFT WING PRESSURE FUELING ADAPTER
FUEL PRESSURE SWITCH
FUEL LEVEL CONTROL SWITCH OWS 75.00 (TYP)
FUEL LEVEL CONTROL SWITCH
FUEL JETTISON OUTLET AND FLAME ARRESTOR
AUXILIARY VENT VALVE
WING TIP RIB
VENT AND FLAME ARRESTOR
NO. 2L TANK OUTBD COMPT FILLER ADAPTER
SUCTION RELIEF VALVE (TYP)
FUEL BOOST PUMP ASSEMBLY TYPICAL TANK SURGE BOXES
FLOAT OPERATED VENT VALVE
TANK ISOLATION VALVE
FLAPPER CHECK VALVES (INNER WING STA 346 (TYP)
ENGINE NO. 1 FIREWALL SHUTOFF VALVE
M1-25000-28-1039

Fuel System General Arrangement
Figure 1

R
R EFFECTIVITY: 025-026, 028-999

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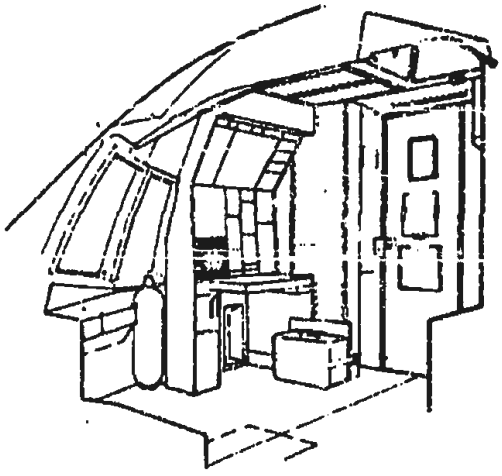
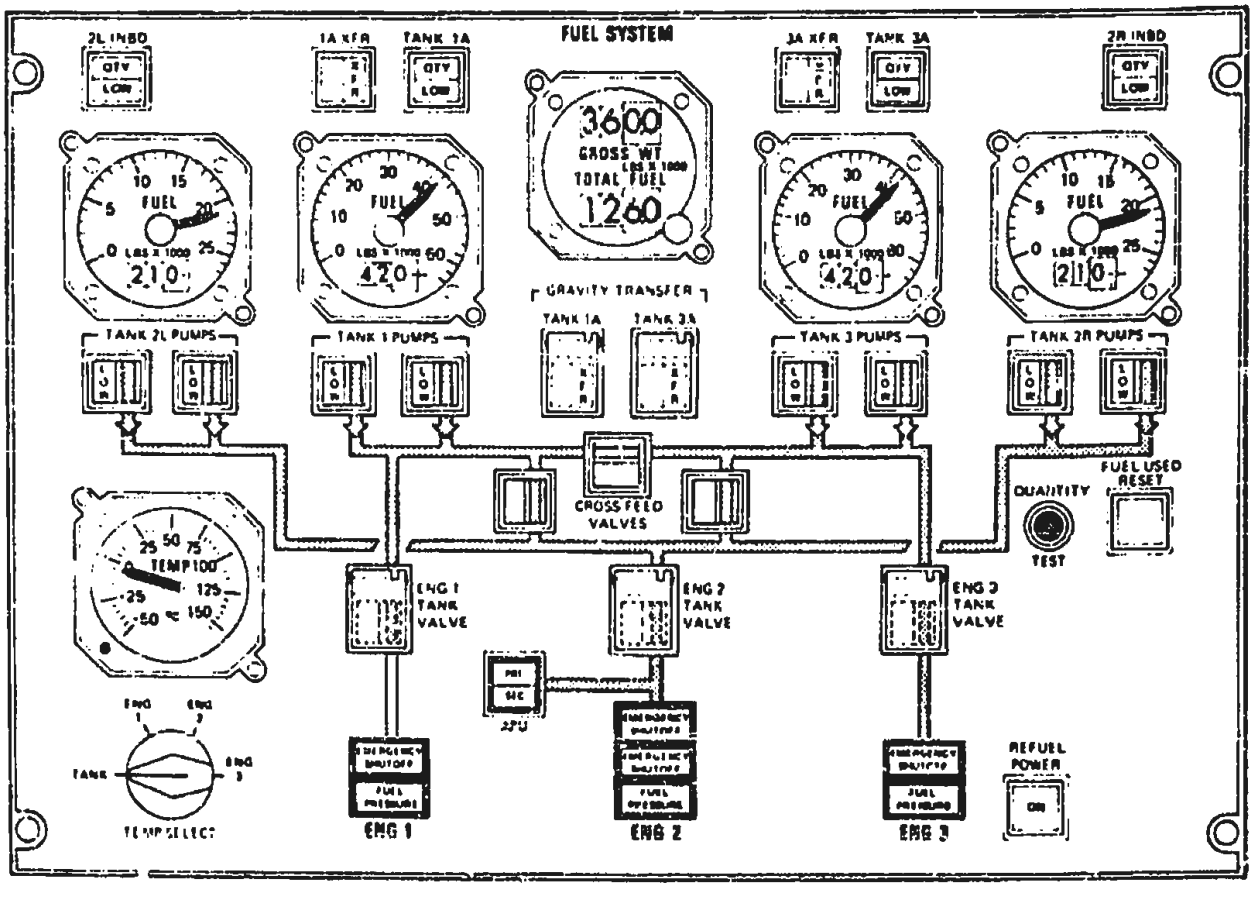


FLIGHT ENGINEER/SECOND OFFICERS STATION
ZONE 215



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Flight Engineer/Second Officers Fuel System Panel
Figure 2 (Sheet 1)

1 TANK 2L AND 2R INBOARD AND TANK 1A AND 3A FUEL QTY SWITCHLIGHT

WHEN SWITCHLIGHT IS RELEASED (OUT), TANK 2L, 1, 3, AND 2R FUEL QUANTITY INDICATORS SHOW TOTAL FUEL IN RESPECTIVE TANKS. WHEN DEPRESSED (LATCHED IN), TANK 2L, 1, 3, AND 2R INDICATORS SHOW AMOUNT OF FUEL IN TANK 2L AND 2R INBOARD SECTIONS AND 1A AND 3A FUSELAGE TANKS. THE QTY LEGEND IS ILLUMINATED WHEN THE SWITCHLIGHT IS DEPRESSED TO PROVIDE AN INDICATION OF SWITCH POSITION. THE LOW LEGEND IS ILLUMINATED BY A THERMISTOR CONTROLLED FUEL LEVEL SENSING CIRCUIT WHENEVER THE FUEL LEVEL IN THE BOOST PUMP SURGE BOX UNCOVERS THE THERMISTOR (APPROXIMATELY 700 POUNDS OF FUEL REMAINING FOR TANKS 2L AND 2R, 375 POUNDS FOR TANKS 1A AND 3A). 1A AND 3A LOW LIGHTS ARE DISABLED WHEN 1A AND 3A XFR SWITCHLIGHTS ARE RELEASED. THE LOW LIGHT CIRCUIT IS TESTED BY DEPRESSING THE QUANTITY PUSH-TO-TEST TEST SWITCH OR THE BITE SWITCH AND THE 2L OR 2R SUMP OR THE 1 OR 3 LL LAMP (REF.) 28-41-00) ON THE SIGNAL CONDITIONERS LOCATED IN THE MESC

2 FUEL QUANTITY INDICATOR (4 PLACES)

INDICATES THE WEIGHT OF FUEL IN RESPECTIVE TANKS 2L, 1 AND 1A, 3 AND 3A, AND 2R. DEPRESSING QUANTITY TEST SWITCH (ITEM 6) WILL DRIVE ALL INDICATOR POINTERS, AND FUEL TOTALIZER (ITEM 5) DIGITAL READOUT UPSCALE TO TEST INDICATING CIRCUITS (REF. 28-41-00)

3 TANK 1A AND 3A TRANSFER

WHEN SWITCHLIGHT IS RELEASED TANK 1A AND 3A FUEL IS NOT BEING TRANSFERED. TANK 1 AND 3 NORMAL SCAVENGE IS BEING PERFORMED. WHEN SWITCHLIGHT IS DEPRESSED TANK 1A AND 3A TRANSFER VALVE IS OPEN. TANK 1 AND 3 HAVE SURGE BOX SCAVENGE ONLY. XFR LIGHT INDICATES WHEN VALVE CONTROL RELAY HAS ENERGIZED. BLUE DISAGREEMENT LIGHT IS MOMENTARILY ON WHILE VALVES ARE IN-TRANSIT AND STAYS ON IF VALVE POSITIONS DO NOT AGREE WITH SWITCHLIGHT POSITION (REF. 28-11-00 AND 28-27-00)

4 TANK 1A AND 3A GRAVITY TRANSFER SWITCHLIGHT

WHEN SWITCHLIGHT IS DEPRESSED GRAVITY TRANSFER VALVE OPENS AND FUEL IS BEING TRANSFERED TO TANKS 1 OR 3 BY GRAVITY. XFR LIGHT INDICATES SWITCH IS IN VALVE OPEN POSITION, OR THAT MASTER JETTISON SWITCHLIGHT IS DEPRESSED. BLUE DISAGREEMENT LIGHT IS MOMENTARILY ON WHEN VALVE IS IN-TRANSIT TO OPEN OR CLOSE POSITION AND STAYS ON IF VALVE POSITION DOES NOT AGREE WITH SWITCHLIGHT POSITION (REF. 28-27-00)

5 FUEL TOTALIZER INDICATOR

PROVIDES DIGITAL READOUT OF TOTAL FUEL WEIGHT AND AIRCRAFT GROSS WEIGHT (AIRCRAFT ZERO FUEL WEIGHT PLUS TOTAL FUEL WEIGHT) (REF. 28-41-00)

6 QUANTITY TEST SWITCH

SWITCH IS HELD DEPRESSED TO TEST FUEL QUANTITY INDICATORS. ALL QUANTITY INDICATIONS WILL DRIVE UPSCALE AND THEN RETURN TO PREVIOUS INDICATION WHEN SWITCH IS RELEASED (REF. 28-41-00)

7 FUEL USED RESET SWITCH

MOMENTARILY DEPRESSING SWITCH RESETS FUEL USED INDICATORS ON ENGINE FUEL PANEL (REF. 73-34-00)

8 REFUEL POWER SWITCHLIGHT

PROVIDES THE FUSO WITH THE CAPABILITY OF RELEASING THE SOLENOID HELD SYSTEM POWER SWITCH ON THE FUELING/DEFUELING PANEL AND THEREBY DEACTIVATING THE FUELING/DEFUELING SYSTEMS. THE SWITCHLIGHT ON LEGEND, WHEN ILLUMINATED, INDICATES THAT THE FUEL INDICATING PANEL IS POWERED. THE ON LIGHT GOES OUT WHEN THE SYSTEM POWER SWITCH RELEASES TO THE OFF POSITION (REF. 28-21-00)

9 CROSSFEED VALVES SWITCHLIGHTS

WHEN SWITCHLIGHTS ARE DEPRESSED (LATCHED IN), RESPECTIVE FUEL SYSTEM (1X FEED, 2X FEED, 3X FEED) CROSSFEED VALVES OPEN. FLOWBAR INDICATES SWITCH IS IN VALVE OPEN POSITION. BLUE DISAGREEMENT LIGHT IS MOMENTARILY ON WHEN VALVE IS IN-TRANSIT TO OPEN OR CLOSE POSITION AND STAYS ON IF VALVE POSITION DOES NOT AGREE WITH SWITCHLIGHT POSITION (REF. 28-25-00)

10 TANK VALVE SWITCHLIGHTS (3 PLACES)

WHEN ENG 1, ENG 2, AND ENG 3 TANK VALVE SWITCHLIGHTS ARE DEPRESSED (LATCHED IN), RESPECTIVE FUEL FEED SYSTEM TANK VALVES OPEN. FLOWBAR INDICATES SWITCHLIGHT IS IN OPEN POSITION. BLUE DISAGREEMENT LIGHT COMES ON AS NOTED IN ITEM 9 (REF. 28-24-00)

NOTE

FLOWBAR IN ENG 1 AND ENG 3 SWITCHLIGHTS WILL GO OFF IF RESPECTIVE TANK VALVE IS CLOSED BY ACTUATION OF RESPECTIVE ENGINE FIRE-PULL HANDLE. ENGINE 2 TANK VALVE IS NOT AFFECTED BY FIRE-PULL HANDLE

11 EMERGENCY SHUTOFF LIGHTS (4 PLACES)

LIGHT COMES ON ONLY WHEN RESPECTIVE FIREWALL SHUTOFF VALVE IS IN-TRANSIT TO CLOSED OR OPEN POSITION. FIREWALL SHUTOFF VALVES ARE OPERATED BY RESPECTIVE ENGINE FIRE-PULL HANDLES (REF. 28-24-00)

12 ENGINE FUEL PRESSURE LIGHT (3 PLACES)

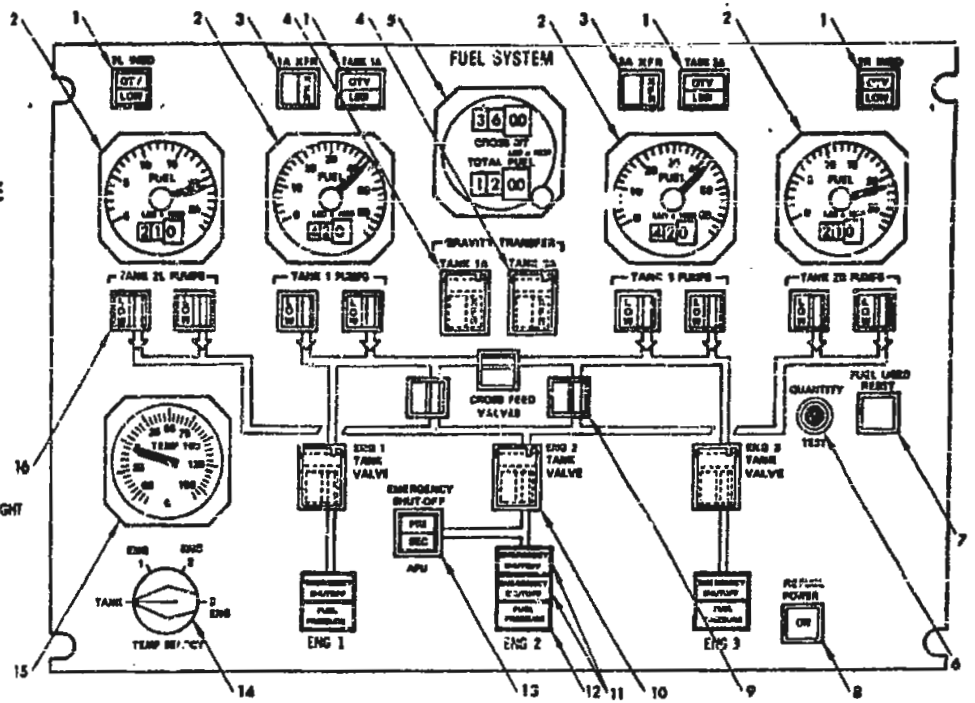
LIGHT INDICATES LOW OUTPUT FROM ENGINE LOW PRESSURE PUMP (REF. 73-11-00)

13 APU EMERGENCY SHUTDOWN LIGHTS

PRI AND SEC LIGHTS COME ON ONLY WHEN APU PRIMARY AND SECONDARY FIREWALL SHUTOFF VALVES ARE IN-TRANSIT TO OPEN OR CLOSED POSITIONS. A STEADY LIGHT INDICATES THAT SHUTOFF VALVE POSITION DOES NOT AGREE WITH POSITION OF APU FIRE-PULL HANDLE (REF. 28-25-00)

14 FUEL TEMPERATURE SELECTOR SWITCH

SELECTS TANK 2L OR ENGINE 1, 2, OR 3 FUEL CONTROL INLET TEMPERATURE FOR DISPLAY ON TEMPERATURE INDICATOR (REF. 73-37-00)



15 FUEL TEMPERATURE INDICATOR

INDICATES TEMPERATURE SELECTED BY TEMP SELECT SWITCH (REF. 73-37-00)

16 TANK 2L, 1, 3, AND 2R BOOST PUMP SWITCHLIGHTS (8 PLACES)

WHEN DEPRESSED (LATCHED IN), SWITCHLIGHT TURNS ON RESPECTIVE TANKS BOOST PUMP, FLOWBAR IS ILLUMINATED TO INDICATE PUMP IS ENERGIZED. LOW LEGEND, WHEN ILLUMINATED, INDICATES PUMP OUTPUT PRESSURE IS 6 (±1) PSIG OR LOWER (REF. 28-26-00)

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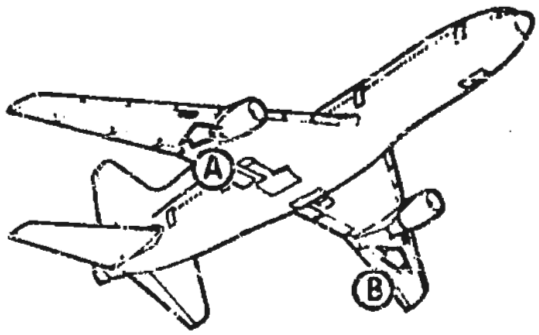
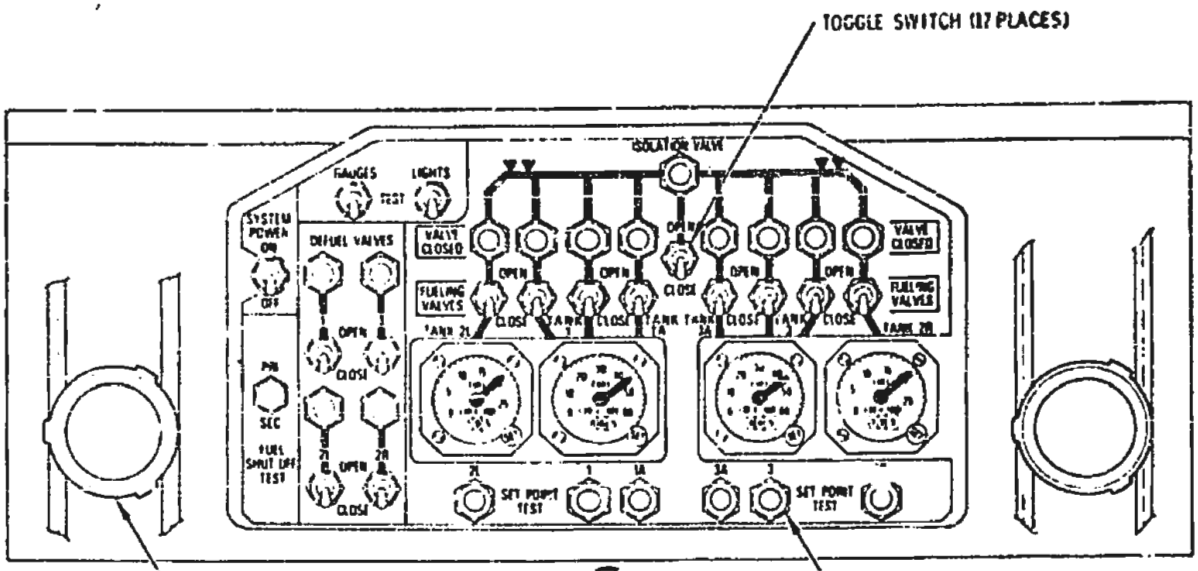
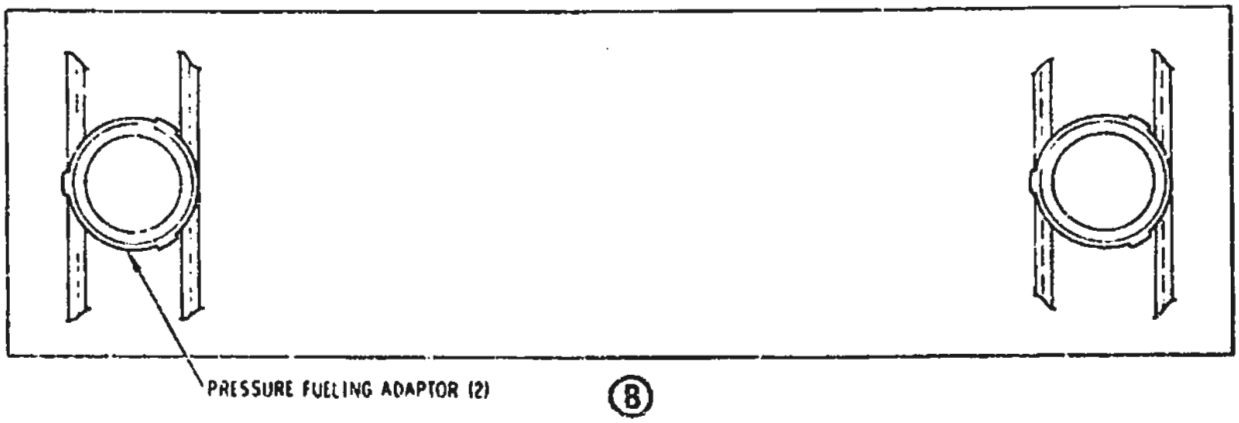
Flight Engineer/Second Officers Fuel System Panel
Figure 2 (Sheet 2)

R EFFECTIVITY: 025-026, 028-999
R







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Fueling/Defueling Panel
Figure 3 (Sheet 1)

R EFFECTIVITY: 025-026, 028-999
R

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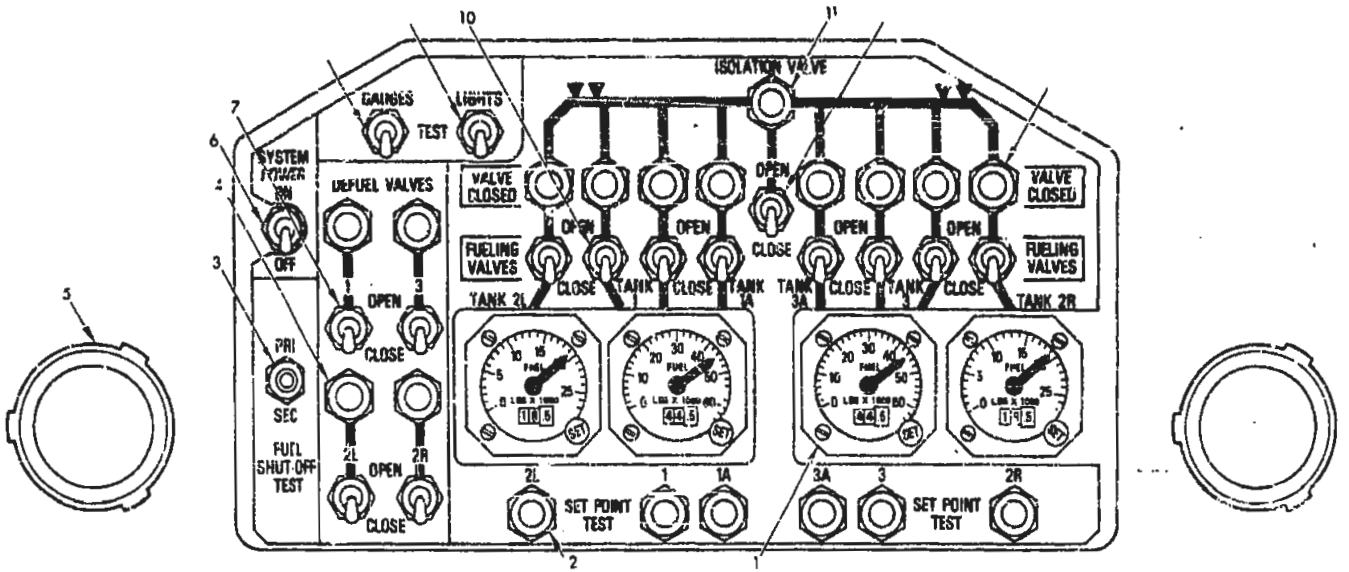

1 FUEL QUANTITY INDICATOR (4 PLACES)

- PROVIDES DIGITAL AND ANALOG INDICATION OF FUEL QUANTITY (REF. 28-41-00).
- INCORPORATES SET POINT INDEX TO PERMIT SELECTION OF DESIRED FUEL QUANTITY. REFUELING IS AUTOMATICALLY TERMINATED WHEN INDICATOR POINTER REACHES INDEX SETTING. TERMINATION OF FUEL FLOW INTO TANK IS INDICATED WHEN CORRESPONDING SET POINT TEST LIGHT GOES OFF AND VALVE CLOSED LIGHT COMES ON (REF. 28-21-00)

2 SET POINT TEST LIGHT (6 PLACES) (REF. 28-21-00)

- PROVIDES INDICATION OF AUTOMATIC SHUTOFF OF FUELING FLOW. LIGHT GOES OFF WHEN INDICATOR POINTER PASSES SET POINT INDEX (REF. 28-21-00)

3 FUEL SHUTOFF TEST SWITCH (REF. 28-21-00)

- SWITCH IS DOUBLE-POLE DOUBLE-THROW MOMENTARY CONTACT TYPE WITH CENTER OFF POSITION
- PRIMARY AND SECONDARY POSITIONS SIMULATE FULL TANK CONDITION TO TEST AUTOMATIC FUEL SHUTOFF OPERATION. THE TEST VERIFIES OPERATION OF THE PRIMARY AND SECONDARY PILOT VALVES IN THE FUELING VALVES AND PRIMARY AND SECONDARY SWITCHES IN THE CORRESPONDING FUEL LEVEL CONTROL SWITCHES
- PROPER TEST RESULT IS INDICATED BY ALL VALVE CLOSED LIGHTS COMING ON

4 DEFUEL VALVES LIGHT (4 PLACES) (REF. 28-22-00)

- LIGHT NORMALLY BLINKS ON, THEN OFF WHEN VALVE IS IN-TRANSIT TO OPEN OR CLOSED POSITION. IF ON STEADY, VALVE IS NOT IN AGREEMENT WITH SWITCH POSITION

5 FUELING/DEFUELING NOZZLE ADAPTER (2 PLACES) (REF. 28-21-00)

- INCORPORATES PROVISIONS FOR ATTACHING STANDARD FUEL HOSE NOZZLES
- NOZZLE ATTACHMENT FLANGE IS DESIGNED TO BREAKAWAY IF PRE-DETERMINED CRITICAL FORCE IS APPLIED TO ADAPTERS THROUGH FUELING HOSES
- BROKEN NOZZLE ATTACHMENT FLANGES CAN BE REPLACED WITHOUT DISASSEMBLY. INTERNAL SPRING LOADED POPPET CLOSES ADAPTER PORT
- TWO FUELING/DEFUELING NOZZLE ADAPTERS ARE ALSO LOCATED IN LEFT WING LEADING EDGE, ZONE 521 FB

6 SYSTEM POWER SWITCH (REF. 28-21-00)

- CONTROLS APPLICATION OF ELECTRICAL POWER TO FUELING/DEFUELING SYSTEM
- WHEN THE SWITCH IS ELECTRICALLY LATCHED IN ON POSITION, SERIVCE PANEL LIGHTS COME ON, FUEL QUANTITY INDICATORS ARE POWERED, FUEL SHUTOFF TEST CIRCUIT IS ARMED, VALVE CLOSED INDICATOR LIGHTS COME ON, AND REFUEL POWER SWITCHLIGHT ON FLIGHT ENGINEER/SECOND OFFICERS FUEL SYSTEM PANEL COMES ON
- IF INADVERTENTLY LEFT ON, SYSTEM POWER SWITCH CAN BE UNLATCHED TO OFF POSITION BY DEPRESSING REFUEL POWER SWITCHLIGHT

7 DEFUEL VALVES SWITCH (4 PLACES) (REF. 28-22-00)

- OPENS OR CLOSES DEFUELING VALVES

8 GAUGES TEST SWITCH (REF. 28-41-00)

- WHEN HELD IN POSITION, SWITCH CHECKS OPERATION OF FUEL QUANTITY INDICATORS
- ALL FUEL QUANTITY INDICATORS DRIVE FULL UPSCALE
- CORRESPONDING SET POINT LIGHTS GO OUT
- ANY FUELING VALVE THAT IS OPEN WILL CLOSE
- SWITCH OPERATES IN PARALLEL WITH QUANTITY TEST SWITCH ON FLIGHT ENGINEER/SECOND OFFICERS FUEL SYSTEM PANEL

9 INDICATOR LIGHTS TEST SWITCH (REF. 28-21-00)

- TESTS PANEL INDICATOR LIGHTS. ANY LIGHT NOT ALREADY ON WILL COME ON WHEN SWITCH IS HELD IN TEST POSITION

10 FUELING VALVE CONTROL SWITCH (8 PLACES) (REF. 28-21-00)

- ARMS FUELING VALVE CIRCUIT FOR OPEN OPERATION
- FUEL PRESSURE IS REQUIRED TO OPEN FUELING VALVE

11 ISOLATION VALVE LIGHT (REF. 28-21-00)

- LIGHT NORMALLY BLINKS ON, THEN OFF, WHEN VALVE IS IN-TRANSIT TO OPEN OR CLOSED POSITION. IF ON STEADY, VALVE IS NOT IN AGREEMENT WITH SWITCH POSITION

12 ISOLATION VALVE SWITCH (REF. 28-21-00)

- OPENS FUELING/DEFUELING MANIFOLD ISOLATION VALVE TO PERMIT FUELING/DEFUELING OF ALL TANKS THROUGH ADAPTERS IN ONE WING ONLY
- PERMITS CROSS-SHIP TRANSFER OF FUEL BY MAINTENANCE PERSONNEL

13 FUELING VALVE POSITION LIGHT (8 PLACES) (REF. 28-21-00)

- LIGHT IS ON WHEN CORRESPONDING FUELING VALVE IS CLOSED

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Fueling/Defueling Panel
Figure 3 (Sheet 2)

R R EFFECTIVITY: 025-026, 028-999

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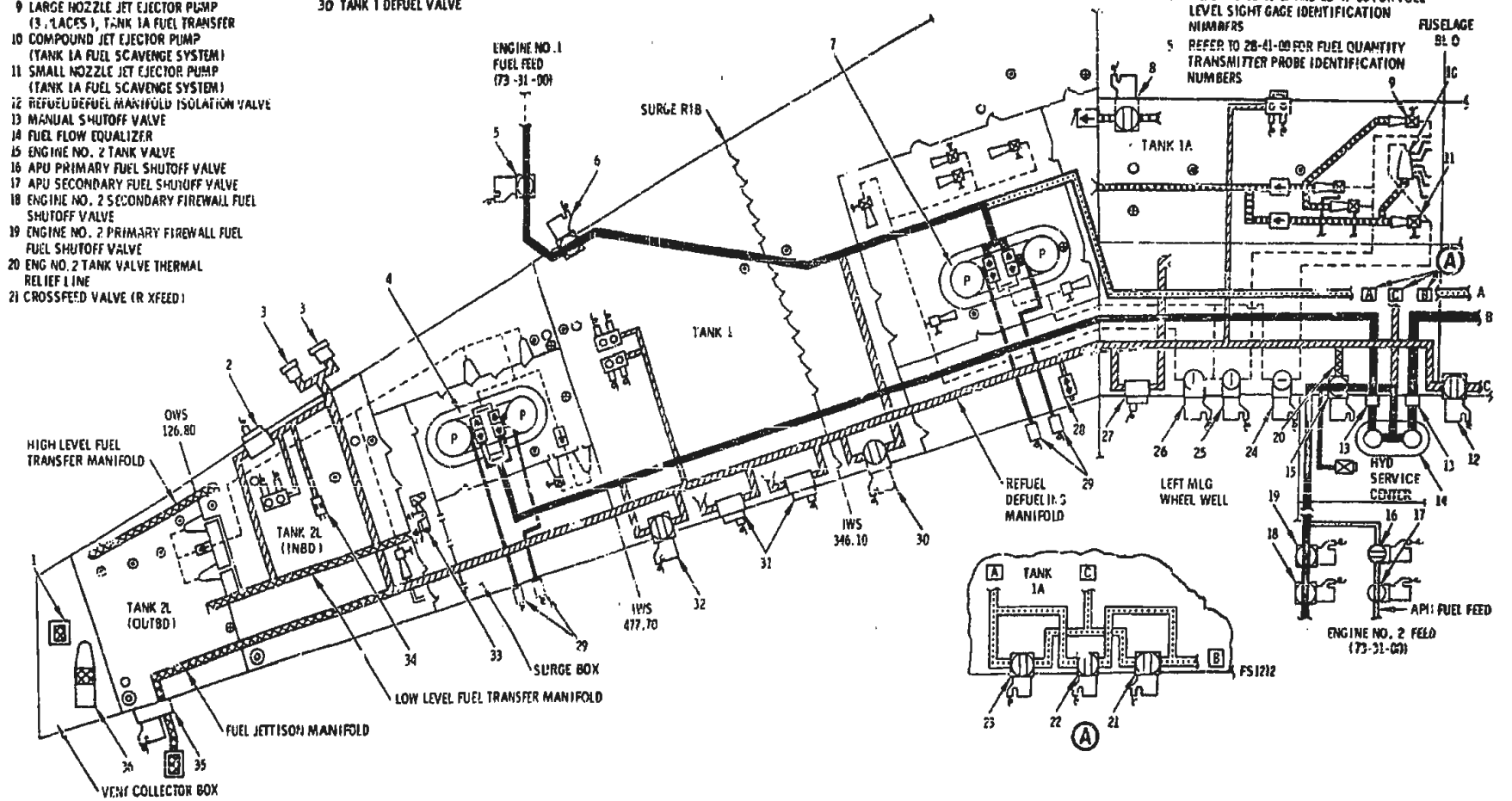
1 AUX VENT BYPASS VALVE
2 TANK 2L FUELING VALVE
3 REFUEL/DEFUEL HOSE ADAPTER
4 TANK 2L BOOST PUMP ASSEMBLY
5 ENGINE NO. 1 FIREWALL SHUTOFF VALVE
6 ENGINE NO. 1 TANK VALVE
7 TANK 1 BOOST PUMP ASSEMBLY
8 TANK 1A GRAVITY TRANSFER VALVE
9 LARGE NOZZLE JET EJECTOR PUMP (3 PLACES), TANK 1A FUEL TRANSFER
10 COMPOUND JET EJECTOR PUMP (TANK 1A FUEL SCAVENGE SYSTEM)
11 SMALL NOZZLE JET EJECTOR PUMP (TANK 1A FUEL SCAVENGE SYSTEM)
12 REFUEL/DEFUEL MANIFOLD ISOLATION VALVE
13 MANUAL SHUTOFF VALVE
14 FUEL FLOW EQUALIZER
15 ENGINE NO. 2 TANK VALVE
16 APU PRIMARY FUEL SHUTOFF VALVE
17 APU SECONDARY FUEL SHUTOFF VALVE
18 ENGINE NO. 2 SECONDARY FIREWALL FUEL SHUTOFF VALVE
19 ENGINE NO. 2 PRIMARY FIREWALL FUEL SHUTOFF VALVE
20 ENG NO. 2 TANK VALVE THERMAL RELIEF LINE
21 CROSSFEED VALVE (R XFEED)
22 CROSSFEED VALVE (C XFEED)
23 CROSSFEED VALVE (L XFEED)
24 TANK 1A FUEL SCAVENGE VALVE
25 TANK 1A FUEL TRANSFER VALVE
26 TANK 1 FUEL SCAVENGE VALVE
27 TANK 1A FUELING VALVE
28 REFUEL/DEFUEL MANIFOLD DRAIN VALVE
29 LOW FUEL PRESSURE SWITCHES
30 TANK 1 DEFUEL VALVE
31 TANK 1 FUELING VALVES
32 TANK 2L DEFUEL VALVE
33 FUEL TRANSFER (FLOAT) VALVE
34 REFUEL/DEFUEL VALVE VENT FITTING
35 FUEL JETTISON VALVE
36 COLLECTOR BOX VENT

NOTE
1 VENT SYSTEM NOT SHOWN (SEE 28-13-00).
2 FOR COMPLETE FUEL SCAVENGE SYSTEM SCHEMATIC SEE 28-10-00.
3 REFER TO SHEET 2 SYMBOL CODE FOR COMPONENTS NOT IDENTIFIED BY INDEX NUMBER.
4 REFER TO 12-11-03 AND 28-41-00 FOR FUEL LEVEL SIGHT GAGE IDENTIFICATION NUMBERS
5 REFER TO 28-41-00 FOR FUEL QUANTITY TRANSMITTER PROBE IDENTIFICATION NUMBERS



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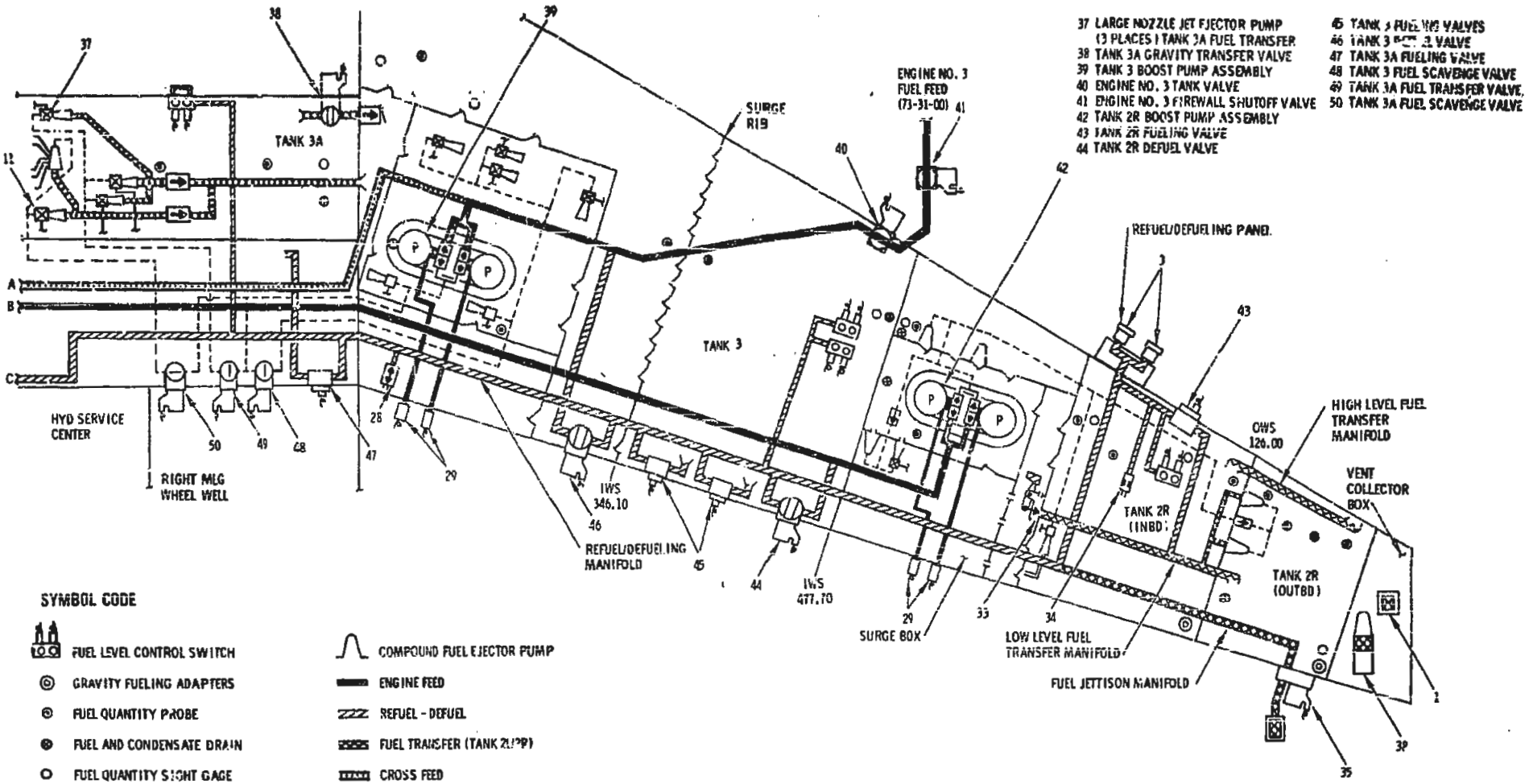
R Fuel System Diagram
R Figure 4 (Sheet 1)

EFFECTIVITY: 025-026, 028-999



R Fuel System Diagram
R Figure 4 (Sheet 2)

EFFECTIVITY: 025-026, 028-999

R FUEL SYSTEM PANEL - REMOVAL AND INSTALLATION

R 1. Referenced Procedures

R	24-00-00	Electrical Power - Maintenance Practice
R	28-11-00	Tanks - Adjustment and Test
R	28-24-00	Engine Fuel Feed System - Adjustment and Test
R	28-26-00	Crossfeed System - Adjustment and Test
R	28-27-00	Fuel Transfer System - Adjustment and Test
R R	28-41-00	Fuel Quantity Indication System - Adjustment and Test
R	33-17-00	Annunciator System - Adjustment and Test
R R	73-37-00	Fuel Temperature Indication System - Adjustment and Test

R 2. Removal/Installation

R A. Removal

R (1) On the FE/SO aft circuit breaker panel CB3, pull and tag FUEL SYSTEM circuit breakers (U1) through (U18) and (T1 through (T13).

R On the FE/SO overhead circuit breaker panel CB2, pull and tag circuit breakers F/E IND LT TEST (H1) through (H6) and F/E PANEL LOWER (J4).

R (2) Release fuel system panel quick-disconnect fasteners.

R (3) Depress secondary latch button and pull fuel system panel from support frame until slide assembly stops are engaged.

R (4) Disconnect electrical harnesses from instrument and instrument panel receptacles.

R (5) Release slide assembly stops and withdraw fuel system panel clear of slides.

R (6) Install protective caps on exposed electrical connectors.

R B. Installation

R (1) Verify that circuit breakers opened in Step 2A(1) are
R open and tagged.

R (2) Engage slides and move fuel system panel forward into
R support frame, then back out until slide assembly stops
R are engaged.

R (3) Remove protective caps and connect electrical harnesses
R to panel and instrument receptacles.

R (4) Depress slide assembly stop locks and push panel until
R secondary latch engages and locks panel in the support
R frame.

R (5) Engage panel quick-disconnect fasteners.

R (6) Remove tags and close circuit breakers opened in Step
R 2A(1).

R (7) Apply external electrical power (Ref. 24-00-00).

R (8) Verify operation of panel lights (Ref. 33-17-00).

R (9) Verify operation of fuel pumps (Ref. 28-24-00).

R (10) Verify operation of engine tank valves (Ref. 28-24-00).

R (11) Verify operation of crossfeed valves (Ref. 28-26-00).

R (12) Verify operation of fuel quantity indicators (Ref.
R 28-41-00).

R (13) Verify operation of 2L and 2R INBD quantity select
R switchlights (Ref. 28-41-00).

R (14) Verify operation of fuel temperature indicator (Ref.
R 73-37-00).

R (15) Verify operation of tank 1A and 3A fuel XFR and gravity
R transfer system (Ref. 28-11-00 and 28-27-00).

STORAGE - DESCRIPTION AND OPERATION

1. General

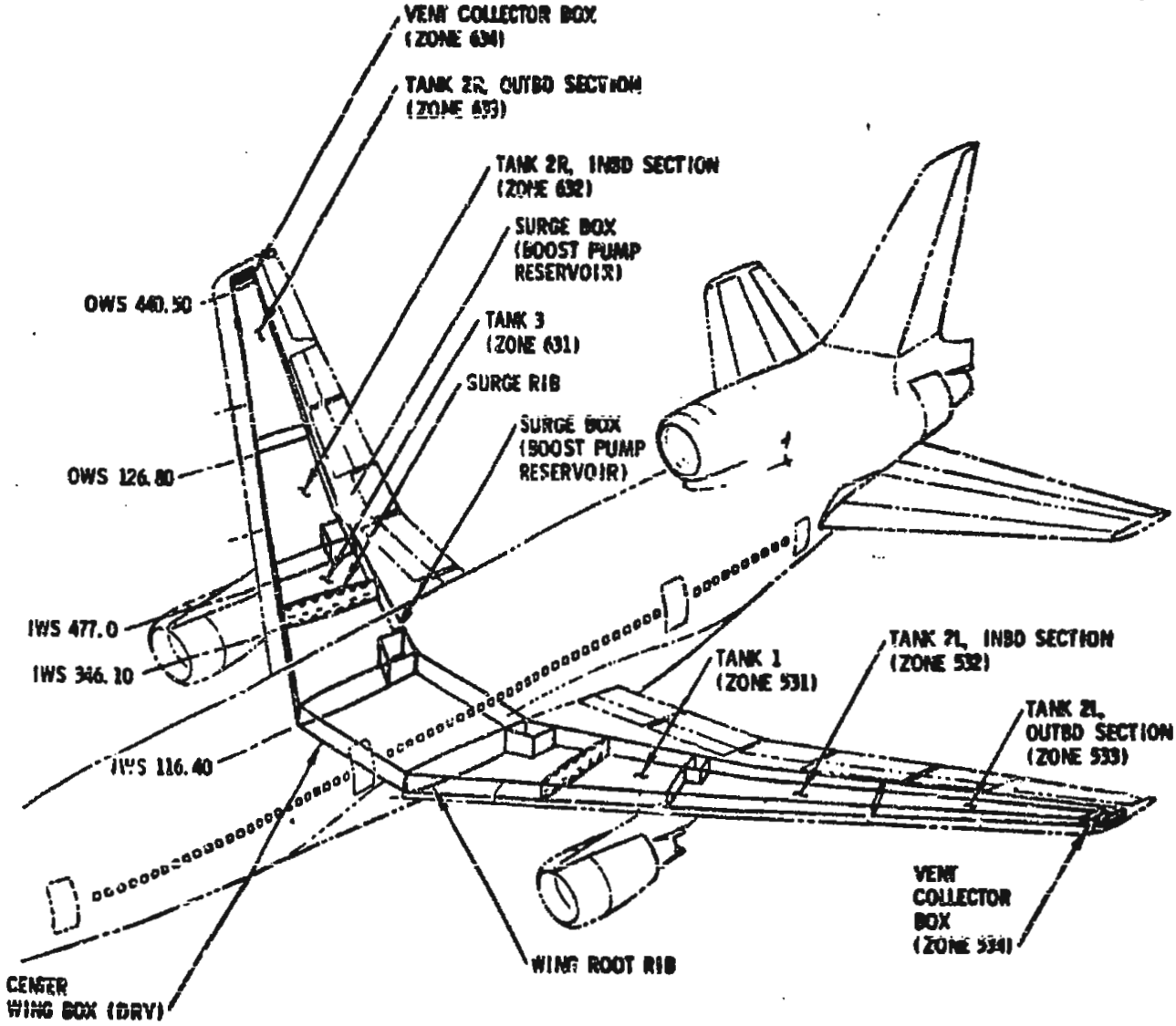
Fuel is contained in four integral wing tanks identified as tanks 2L, 1, 3, and 2R, and in extended range aircraft, in two integral wing center section tanks identified as tanks 1A and 3A (Ref. Fig. 1).

R Tanks 1A and 3A (-100 aircraft) are primarily tank 1 and 3 auxiliary tanks. In flight, fuel in these tanks is transferred into the companion 1 and 3 tanks as tank 1 and 3 fuel is consumed (Ref. 28-27-00).

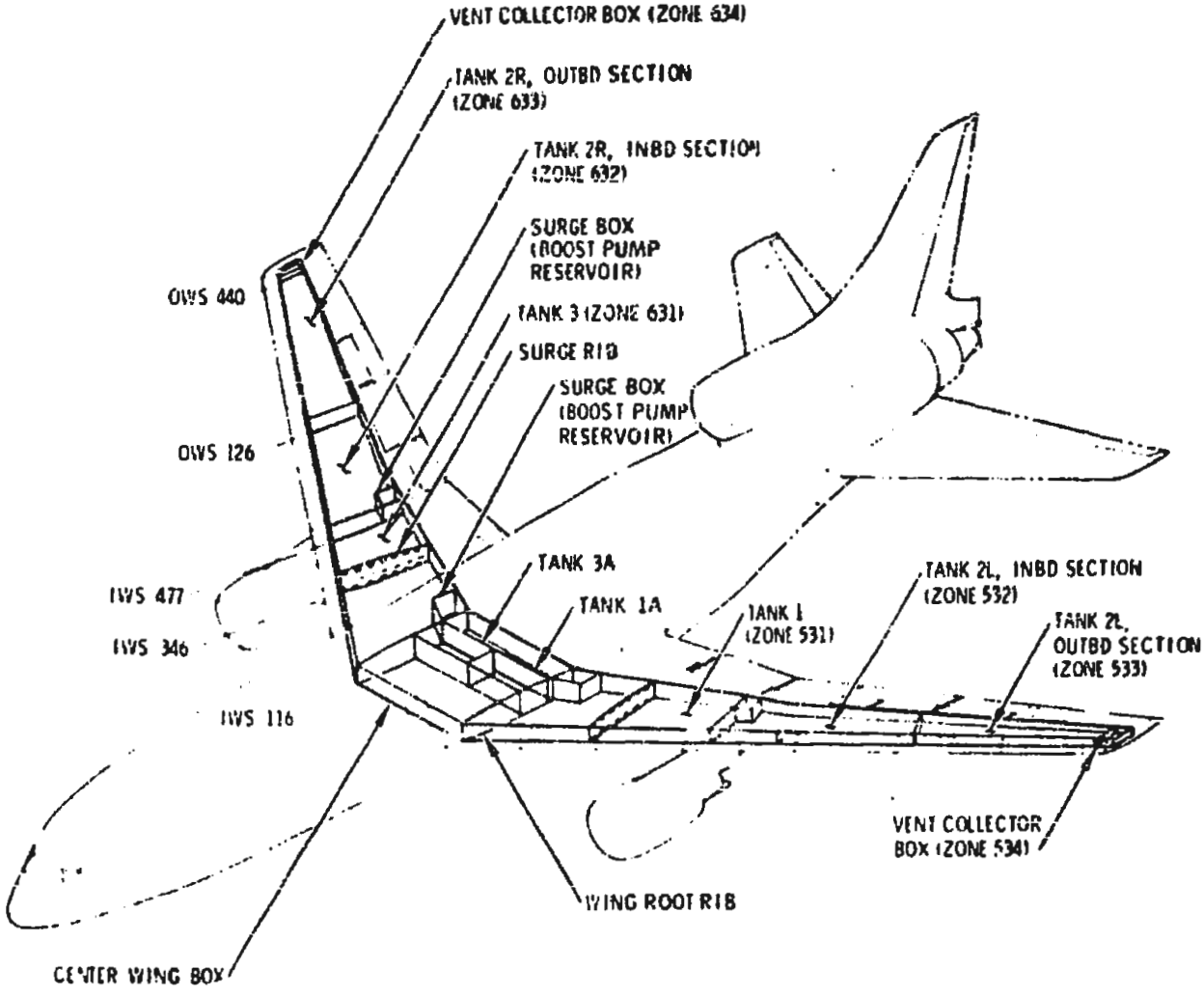
For structural load relief reasons, the 2L and 2R outboard wing tanks are divided into inboard and outboard sections. Fuel is normally retained in the outboard section until fuel remaining in the inboard section is approximately 1000 pounds (Ref. 28-27-00).

Fuel Tank capacities are tabulated in maintenance manual Section 12-11-02.

Fuel sloshed into the vent system during taxiing and flight is captured in vent collector boxes at each wingtip. This fuel is returned to the outboard sections of tank No. 2L or 2R by the fuel scavenge system (Ref. 28-11-00).



Fuel Tank Arrangement
Figure 1



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Fuel Tank Arrangement
Figure 1

TANKS - DESCRIPTION AND OPERATION

1. General

R Fuel is contained in four wing tanks (Ref. Fig. 1). Wing tanks are integral parts of the wing structure with tank boundaries defined by the forward and aft wing spars, and wing rips at INS 477.0 and OWS 126.8 (Ref. Fig. 1). Wing tanks are designated (left to right) as tanks 2L, 1, 3, and 2R. Although fuel can be R routed to either engine from any wing tank through a crossfeed system, tank No. 1 is the normal source of fuel for engine No. 1 and tank No. 3 for engine No. 3. The outboard tanks, 2L and 2R, R normally supply the No. 2 engine simultaneously through a flow equalizer. To minimize structural loads in flight, tanks 2L and 2R are divided into inboard and outboard sections. Fuel is R normally retained in the outboard sections until the inboard R section has been depleted to approximately 1000 pounds (454 R Kilograms). Fuel is then automatically transferred to the inboard section through a float actuated valve (Ref. 28-27-00).

Dual boost pump motor and impeller elements (Ref. 28-24-00) are contained in canister type housings secured to the lower wing skin, and may be replaced from underwing locations without defueling the tank. To assure availability of fuel to the engine fuel feed system under all anticipated aircraft attitudes and at lower fuel tank levels, each pump unit is installed in a R surge box reservoir having a fuel capacity of approximately 1000 R pounds (454 Kilograms). Fuel is retained in the surge boxes by R flapper type check valves installed in the surge box walls. Baffle plates assure that the boost pump inlet parts are always immersed in fuel.

A fuel scavenge system incorporating single and compound jet ejector pumps powered by motive fuel supplied by the boost pumps continually draws fuel from the lowest (sump) areas of the tanks and dumps it into the baffled portion of the surge boxes. In the process of performing this function, the scavenge system transfers any water that may have collected in the lower tank areas to the boost pump inlets where it can be pumped into the engine fuel feed system and consumed in the engines. In addition, the fuel scavenge system continually evacuates fuel from the tank vent collector boxes, precluding spillage of fuel from the wingtip vents. This fuel is picked up by two compound jet ejector pumps in the tank No. 2L and 2R outboard sections and is routed along with fuel scavenged from the outboard side of the tank separation rib to the fuel low-level transfer manifold and, until such time as transfer of fuel to the inboard section is initiated, is returned to the outboard section.

Since the motive fuel flow which operates the outboard section compound ejector pumps is inboard section fuel pumped to the ejectors by the fuel boost pumps, a continuous transfer of fuel to the outboard section occurs whenever the pumps are operating. Fuel that may have migrated to the inboard section while the aircraft is parked, is thus returned to the outboard section. The scavenge system thus performs the additional function of restoring and maintaining the scheduled fuel load distribution between the tank 2L/2R inboard and outboard sections.

All wing-installed fuel distribution piping and manifolds are installed within the tank boundaries. Any fuel leakage that might occur from the piping and manifold interconnect couplings is thus confined harmlessly to the internal tank areas.

A tank venting systems interconnects each tank to vent boxes in each wing tip and is described in Section 28-13-00.

Fuel system fueling and defueling valves consist of valve assembly housings and line replaceable plug-in elements containing the operational flow control and actuator portions of the valve assembly. Wing tank valve housings are mounted internally in the tanks on the wing spars and installed as part of the fuel distribution piping. Plug-in elements are accessible from locations outside of the tank and may be replaced without defueling.

Fifteen fuel quantity transmitter probes (Ref. 28-41-00) are installed in each wing: six in tanks 1 and 3, five in each tank 2L and 2R inboard section, and four in each tank 2L and 2R outboard section. Probes are inserted through holes in the upper skin panel and flange mounted to support rings permanently installed at each hole. Probes are identified by location numbers embossed in the probe support base, probe number 1 being the most outboard probe in the wing.

Six fuel level sight gages (Ref. 28-41-00) are installed in each wing tank; two in tanks 1 and 3, three in tank 2L and 2R inboard sections, and one in the extreme outboard corner of tank 2L and 2R outboard sections. Sight gage support bases are flange mounted to the lower wing skin panels. In operation, a calibrated fuel level measuring stick is unlatched and allowed to extend below the wing to a point where it is magnetically coupled to a float surrounding the stick housing.

Five fuel and condensate drain valves are installed in the lower wing skin panels of each wing tank: two valves are in tank 1 and 3, three in tank 2L and 2R inboard sections, and one in each tank 2L and 2R outboard section. A significant feature of each valve is the incorporation of primary and secondary valve poppets. This permits replacement of a leaking primary poppet seal without loss of fuel.

Overwing manual fueling hose receptacles (Ref. 28-21-00) are installed in the upper wing surface of tanks No. 2L and 2R. One receptacle is provided for each tank section. There are no
R overwing provisions for fueling tank 1 and 3. Fueling of these tanks is accomplished by on-the-ground transfer of fuel from the outboard tanks.

2. Fuel Tank Access Covers

A. Description

Access to wing fuel tanks and wingtip vent boxes is acquired by removing one or more of 20 access covers installed in the lower wing surface and one or more of 3 access covers in the wing upper surface (Ref. Fig. 1 and 2). The three access covers in each upper wing surface provide access to tank fuel level control switches and vent valves and to the vent collector boxes. Cover plates provide access to the fuel boost pump plug-in elements. Figure 3 shows the relationship of the various access holes and nearby wing ribs.

Lower wing access covers are mounted inside the wing and are retained with one-quarter inch diameter screws. The screws are inserted through clamp rings and wing skin, and are threaded into self-locking floating nuts installed in the access cover (Ref. 57-33-00).

Upper wing surface access covers (Ref. 57-33-01) are mounted on the outside of the wing skin and retained by screws that thread into a clamp ring mounted internally in the tank. The clamp ring is prevented from falling inward by four retainers. Provisions are provided for installation of a handle to aid in removal of the covers.

3. Flapper Check Valves

A. Description and Operation

Flapper check valves (Ref. Fig. 3, 4, and 5) are located in each wing tank surge box and on the inner wing station 346.00 surge rib. The check valves installed on the surge box reservoir walls serve in conjunction with the fuel scavenge system in keeping the fuel feed boost pumps submerged under all flight attitudes. The check valves located on the tank 1 and 3 surge ribs serve to retain fuel at the inboard ends of these tanks during low wing attitudes.

Surge box and surge rib flapper check valves consist of a hinged circular or rectangular plate and a body having a seat for the plate to bear against, and provisions for attaching the body to the tank structure. The assembly is mounted vertically over a matching hole in the supporting structure in a position that allows the plate to free fall against the valve seat. Fuel flow through the valve is restricted by contact between plate and seat. Valve open and close positions are determined by differential forces of fuel flowing toward or away from the valve flapper.

The flapper check valves installed at the outlet ports of the compound jet ejector pumps in tank 2L and 2R function in the same manner as noted above.

4. Fuel Scavenge System

A. Description and Operation

A fuel scavenge system (Ref. Fig. 6 thru 9) consisting of single and compound jet ejector pumps (Ref. Fig. 6), check valves, flapper check valves, and associated piping, is installed in each tank.

The scavenge system performs five important functions:

(1) It continually removes water that collects in the remote low (sump) areas of the tanks, thereby retarding microbiological growth.

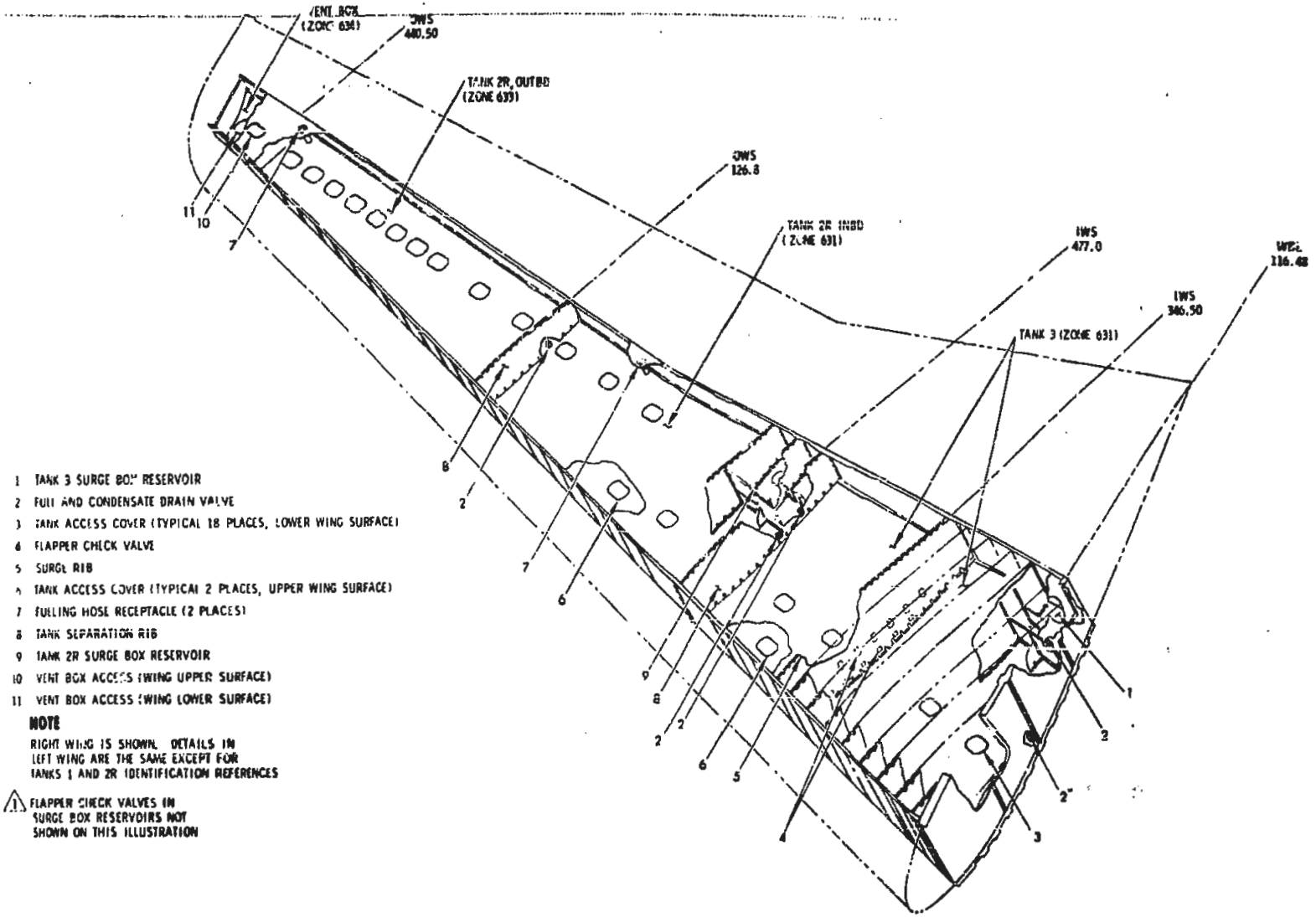
(2) It removes fuel sloshed into the vent collector boxes during taxi turns and other maneuvers.

(3) It continually draws fuel from the low tank areas and dumps this fuel into the boost pump surge boxes thereby assuring that the pump inlets are submerged under all normal flight attitudes.

(4) It significantly reduces the amount of unusable fuel in the tanks.

(5) It returns fuel from the inboard to outboard sections of tanks 2L and 2R at approximately 100 lbs per minute, thereby maintaining correct fuel distribution levels in the two sections.

Four large (single nozzle) and two small (single nozzle) fuel ejector pumps are installed in each of the tank 1 and 3 boost pump surge boxes.



1 TANK 3 SURGE BOX RESERVOIR
2 FUEL AND CONDENSATE DRAIN VALVE
3 TANK ACCESS COVER (TYPICAL 18 PLACES, LOWER WING SURFACE)
4 FLAPPER CHECK VALVE
5 SURGE RIB
6 TANK ACCESS COVER (TYPICAL 2 PLACES, UPPER WING SURFACE)
7 FUELING HOSE RECEPTACLE (2 PLACES)
8 TANK SEPARATION RIB
9 TANK 2R SURGE BOX RESERVOIR
10 VENT BOX ACCESS (WING UPPER SURFACE)
11 VENT BOX ACCESS (WING LOWER SURFACE)

NOTE

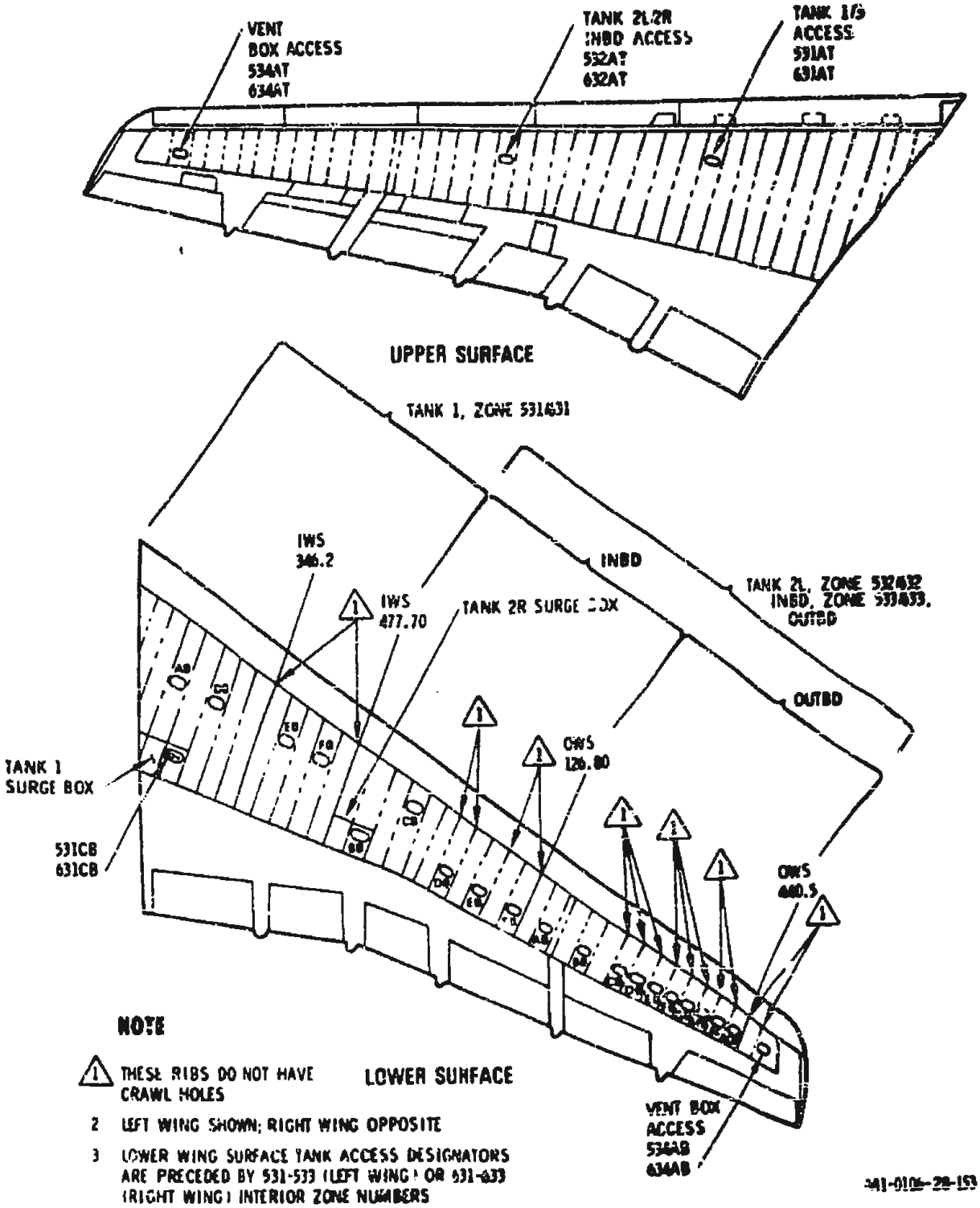
RIGHT WING IS SHOWN. DETAILS IN LEFT WING ARE THE SAME EXCEPT FOR TANKS 1 AND 2R IDENTIFICATION REFERENCES

⚠1 FLAPPER CHECK VALVES IN SURGE BOX RESERVOIRS NOT SHOWN ON THIS ILLUSTRATION

M1-0104-28-009

R Fuel Tanks
R Figure 1

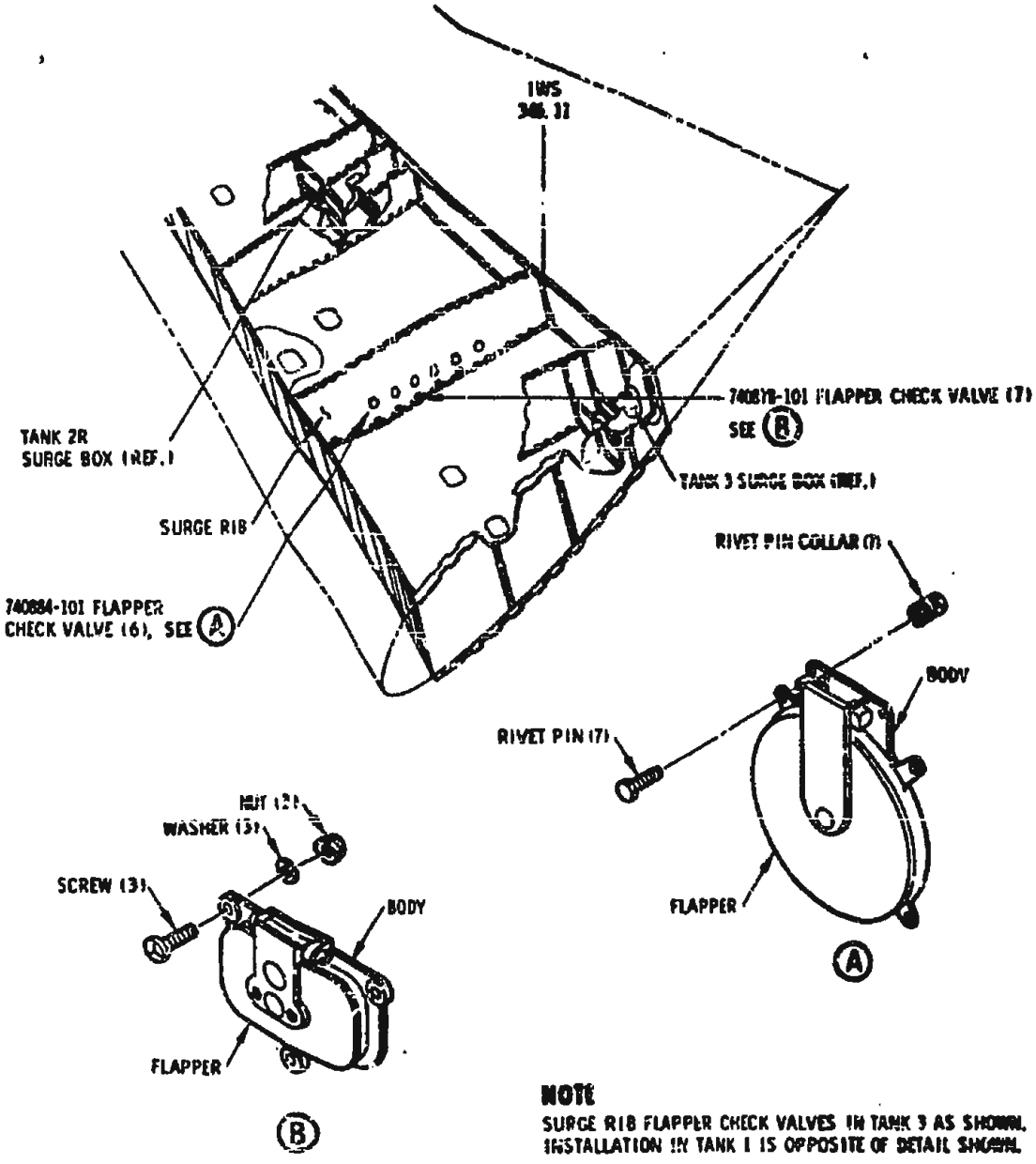
EFFECTIVITY: 001-024



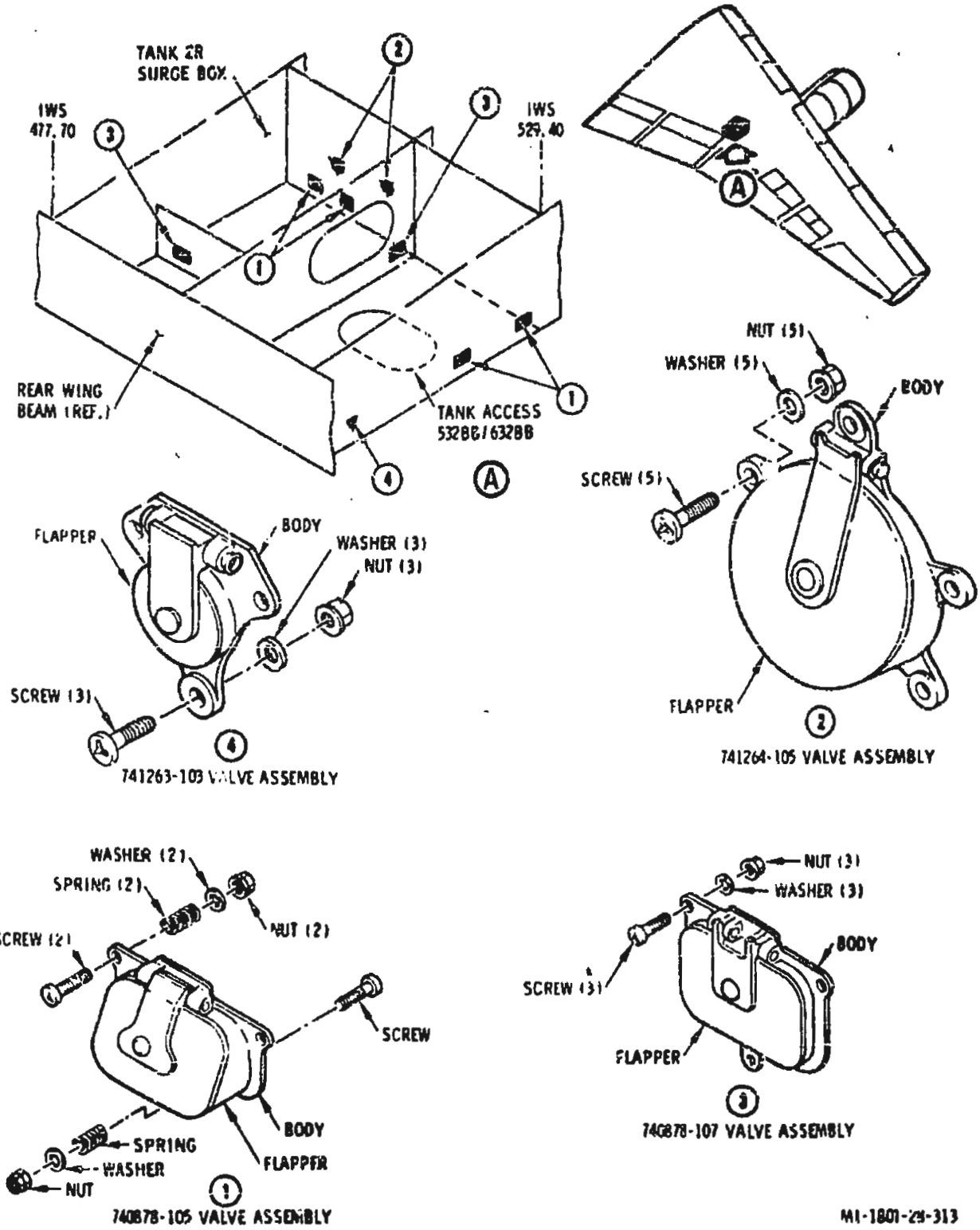
R
R

Fuel Tank Access Covers
Figure 2

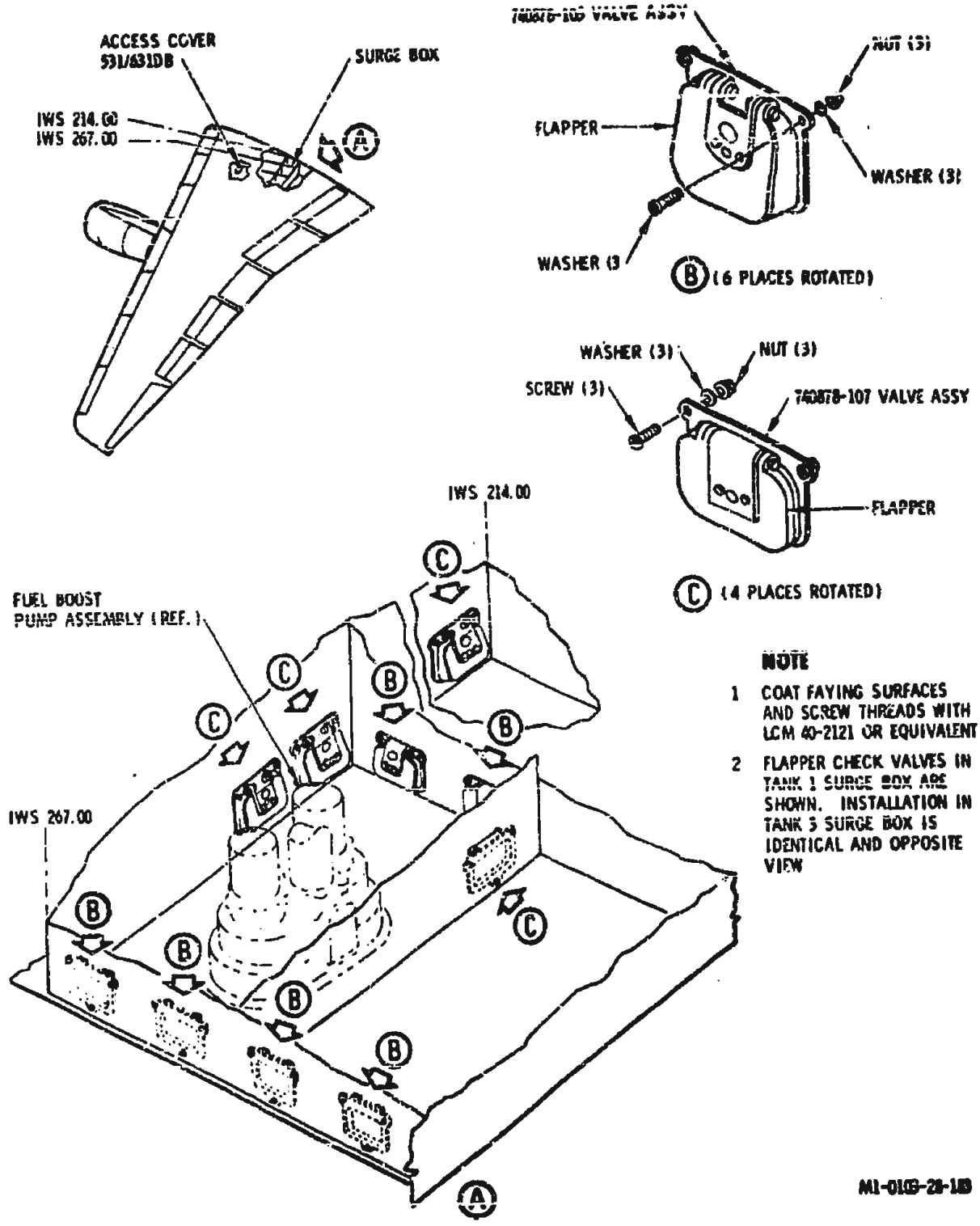
EFFECTIVITY: 001-024, 027



Flapper Check Valves, Tank 1 and 3 Surge Ribs
Figure 3



Flapper Check Valves, Tank 2L and 2R
Figure 4



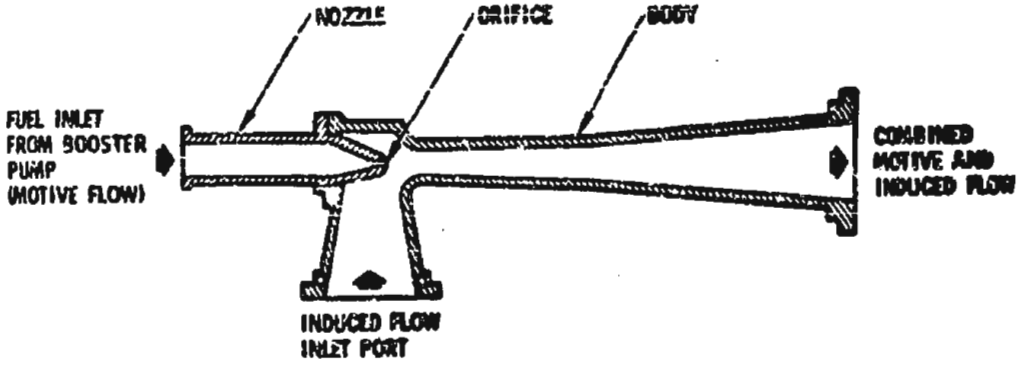
Flapper Check Valves, Tank 1 and 3
Figure 5

Induced flow (fuel pickup) tubing attached to these pumps is routed to the low (sump) areas at the wing root rib and aft spar just outboard of the surge box. Five compound ejector pumps, each an assembly of five small nozzle ejectors clustered in a single unit having a common motive fuel flow inlet port are installed in each of the 2L and 2R outboard tanks. Two of the pumps are attached to forward side of the surge box forward partition and one on the aft wall of the boost pump well next to a large (single nozzle) pump. Flapper check valves at the outlet ports of these pumps inhibit reverse flow (syphoning) of fuel out of the boost pump well when the boost pumps are off. The remaining two compound pumps are installed in the outboard tank section on the OWS 126.00 tank divider rib. The induced flow tubing to these pumps is routed along the outboard side of the rib to tank low areas between the lower tank surface stringers. Fuel picked up by these pumps is routed into a common manifold connected to the tank low fuel transfer manifold and is dumped into the inboard section surge box area through the float actuated fuel transfer valve (Ref. 28-27-00).

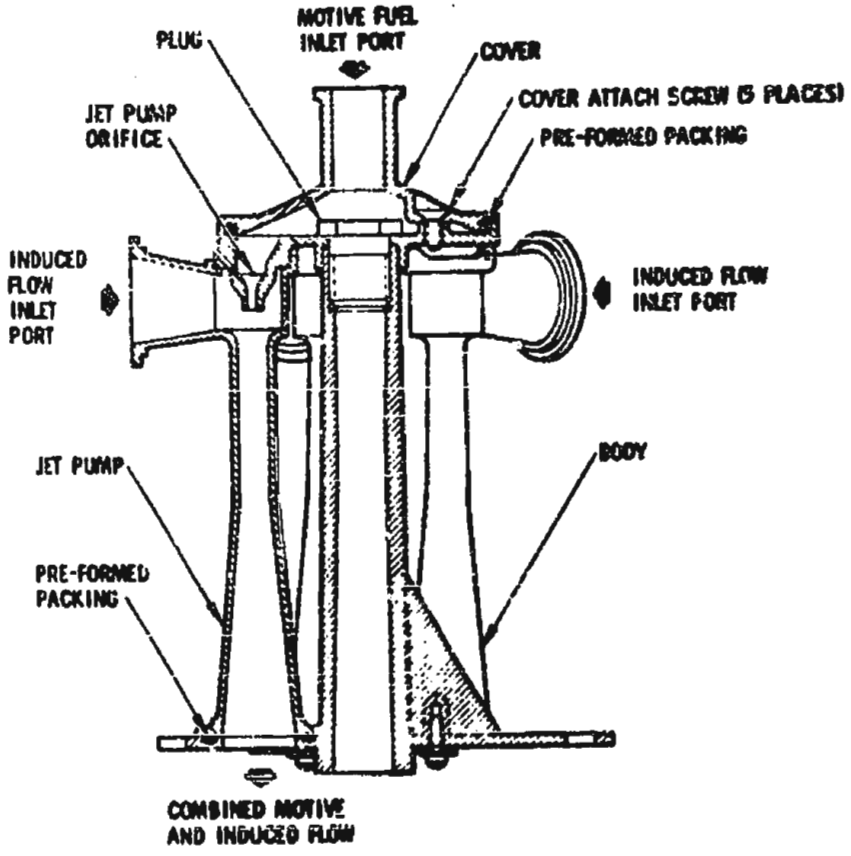
An additional small nozzle ejector pump is located on the outboard side of IWS 529.40 wing rib. This pump picks up the fuel that would remain in this area when fuel levels are low and ejects its combined motive and induced fuel through a flapper check valve into the tank surge box.

Operation of the scavenge system is based on the jet pump effect created by motive fuel flow through a venturi which induces, by aspiration, a secondary flow of fuel through pickup lines routed to various low points in the tank. Fuel which would otherwise remain in these areas as unusable fuel is thus made available to the engine fuel feed system. Motive fuel flow is supplied by the engine fuel feed boost pumps through a screen and check valve mounted in the discharge chamber of the boost pump canister.

The system thus operates in conjunction with the surge box flapper check valves (and transfer valves in tank 2L and 2R) in assuring that the maximum amount of usable fuel is made available at the boost pump inlets. An additional important function performed by the scavenge system is to continually withdraw fuel from the vent collector boxes, thus precluding spillage out of the wingtip vents. This fuel is picked up by induced flow tubes attached to the two compound ejectors in the tank 2L and 2R outboard compartments and routed along with induced fuel flow from the low tank areas just outboard of the tank separation rib to the fuel transfer manifold.



SINGLE NOZZLE JET EJECTOR PUMP



COMPOUND JET EJECTOR PUMP

R
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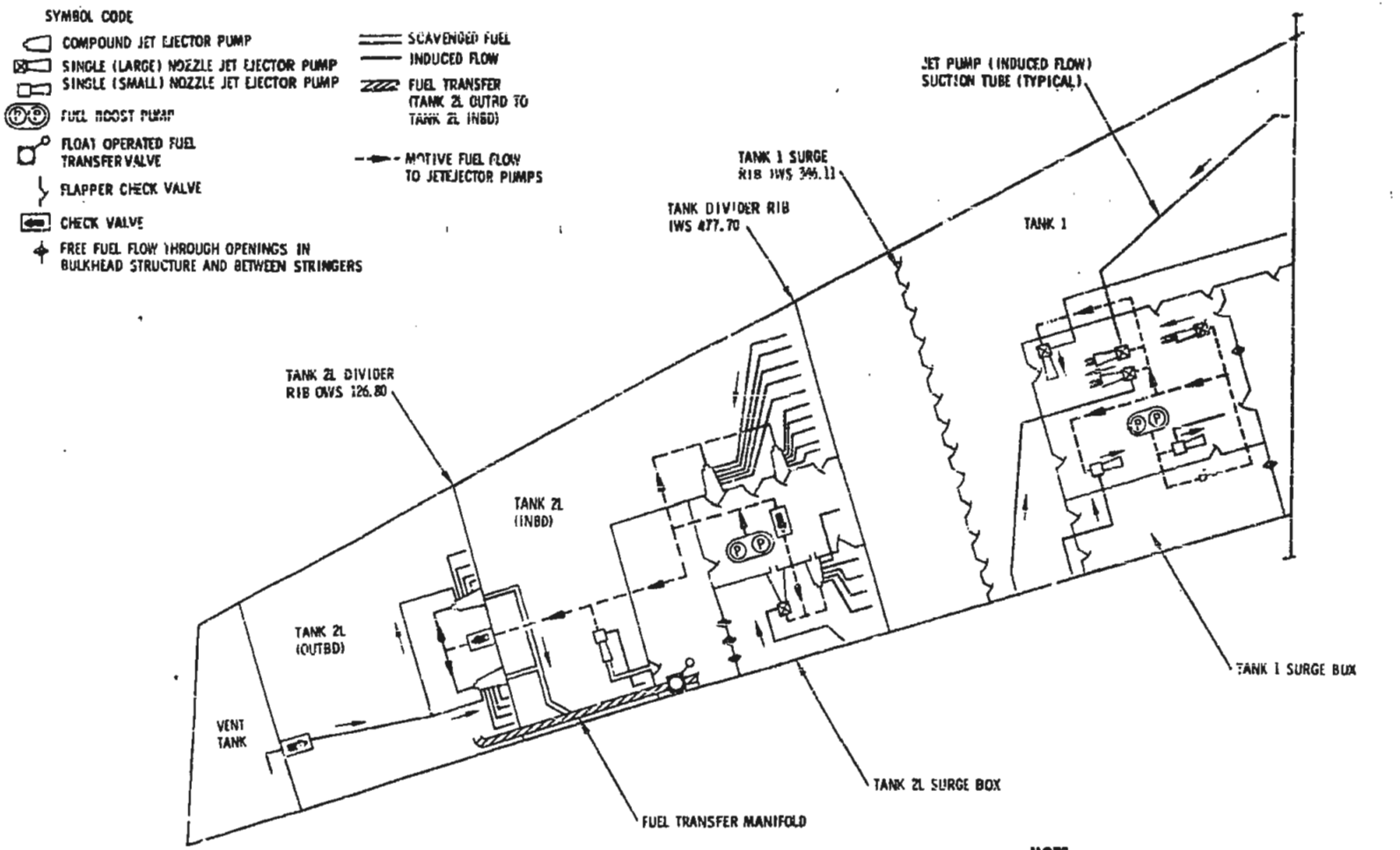
Jet Ejector Pumps
Figure 6

EFFECTIVITY: 001-024, 027


SYMBOL CODE
COMPOUND JET EJECTOR PUMP
SINGLE (LARGE) NOZZLE JET EJECTOR PUMP
SINGLE (SMALL) NOZZLE JET EJECTOR PUMP
FUEL BOOST PUMP
FLOAT OPERATED FUEL TRANSFER VALVE
FLAPPER CHECK VALVE
CHECK VALVE
FREE FUEL FLOW THROUGH OPENINGS IN BULKHEAD STRUCTURE AND BETWEEN STRINGERS
SCAVENGED FUEL
INDUCED FLOW
FUEL TRANSFER (TANK 2L OUTBD TO TANK 2L INBD)
MOTIVE FUEL FLOW TO JETEJECTOR PUMPS
JET PUMP (INDUCED FLOW) SUCTION TUBE (TYPICAL)
TANK 1 SURGE RIB IWS 346.11
TANK DIVIDER RIB IWS 477.70
TANK 1
TANK 2L DIVIDER RIB OWS 126.80
TANK 2L (INBD)
TANK 2L (OUTBD)
VENT TANK
TANK 1 SURGE BOX
TANK 2L SURGE BOX
FUEL TRANSFER MANIFOLD

NOTE:

1 TANK 2L AND 3 FUEL SCAVENGE SYSTEM SHOWN. TANK 2R AND 3 SCAVENGE SYSTEMS ARE IDENTICAL.

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R
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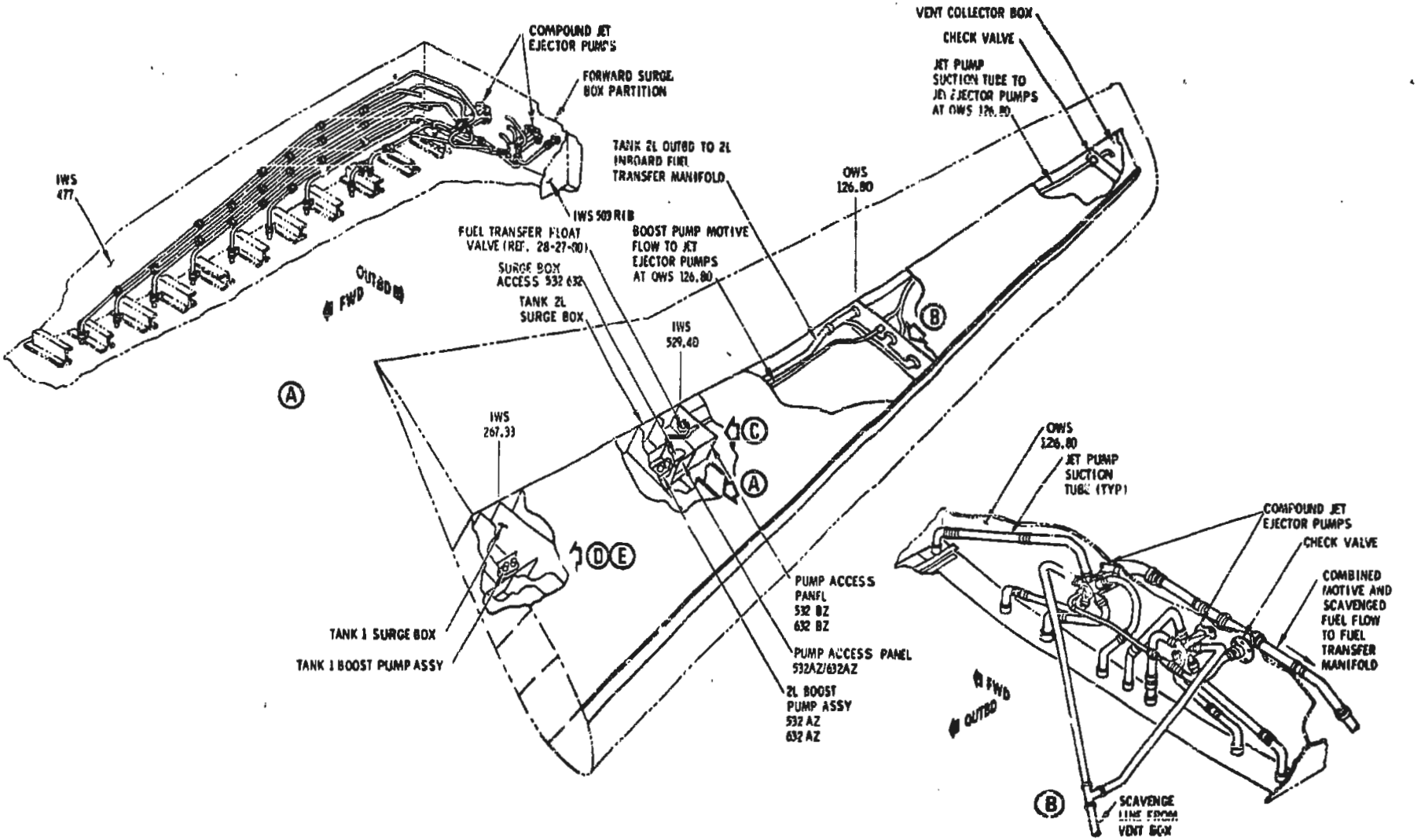
Fuel Scavenge System Diagram
Figure 7

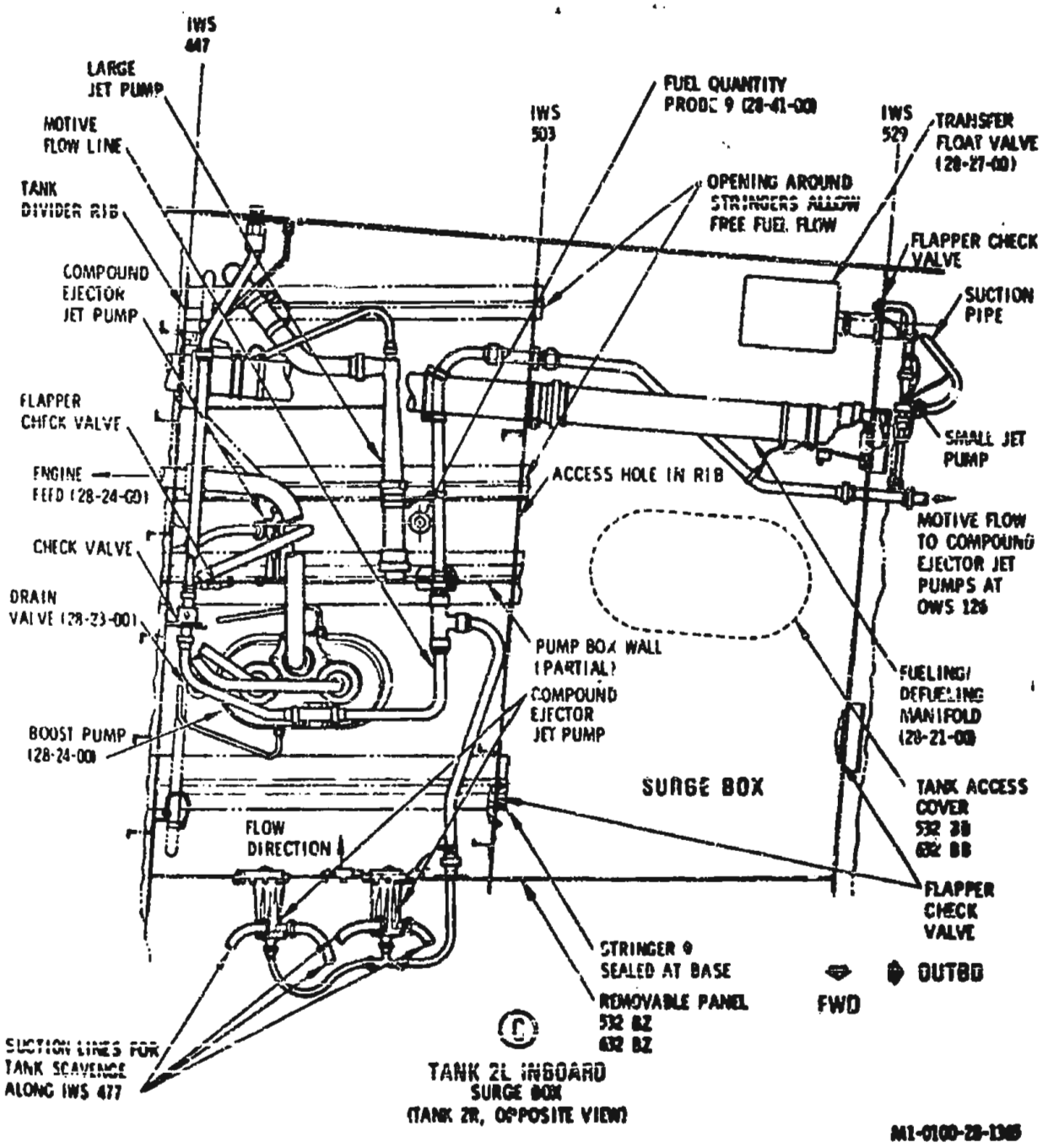
EFFECTIVITY: 001-224, 027



M1-72200-28-1368

R Fuel Tank Scavenge System
R Figure 8 (Sheet 1)

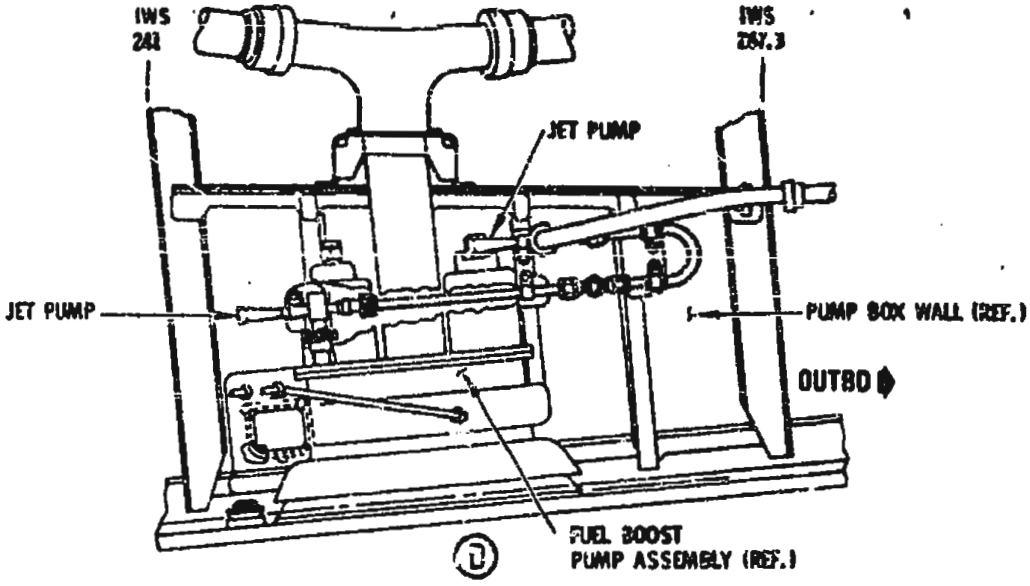
EFFECTIVITY: 001-024, 027

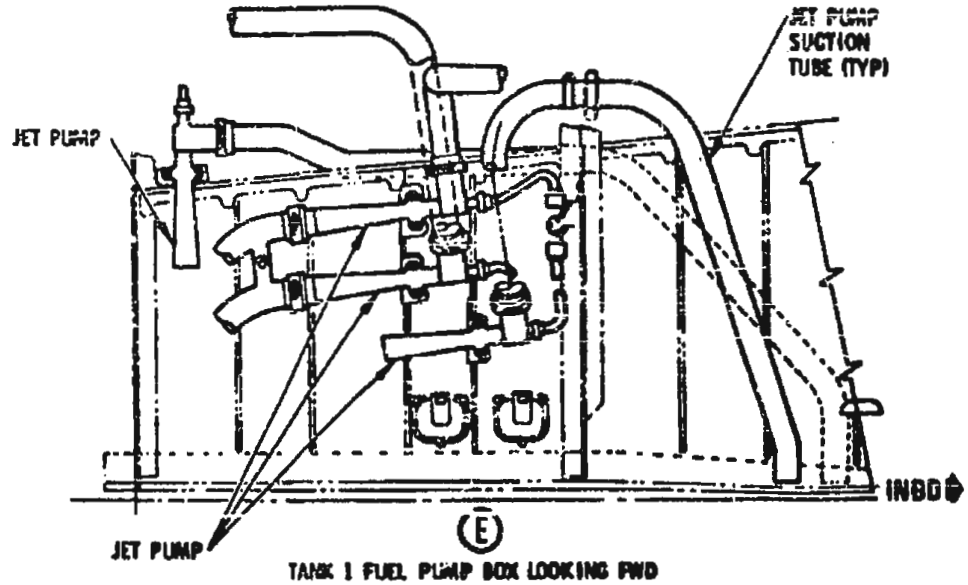


R
R

Fuel Tank Scavenge System
Figure 8 (Sheet 2)

EFFECTIVITY: 001-024, 027





M1-0100-28-1344

R Fuel Tank Scavenge System
R Figure 6 (Sheet 3)

EFFECTIVITY: 001-024, 027

TANKS - DESCRIPTION AND OPERATION

1. General

Fuel is contained in four wing tanks and two wing center section tanks (Ref. Fig. 1). Wing tanks are integral parts of the wing structure with tank boundaries defined by the forward and aft wing spars, and wing ribs at IWS 477.0 and OWS 126.8. Center section tanks are integral parts of the wing center section structure and are defined by the wing root closing ribs, fuselage station 1103 and 1163 center section box beams, and a partition at fuselage buttock station FBL-0. Wing tanks are designated (left to right) as tanks 2L, 1, 3, and 2R. Center section tanks are designated as tanks 1A and 3A. Fuel in these tanks is normally transferred to companion wing tanks 1 and 3 by a jet ejector pump fuel transfer system (Ref. 28-27-00).

Although fuel can be routed to either engine from any wing tank through a crossfeed system, tank No. 1 is the normal source of fuel for engine No. 1 and tank No. 3 for engine No. 3. The outboard tanks, 2L and 2R, normally supply the No. 2 engine simultaneously through a flow equalizer. To minimize structural loads in flight, tanks 2L and 2R are divided into inboard and outboard sections. Fuel is normally retained in the outboard sections until the inboard section has been depleted to approximately 1000 pounds (454 Kilograms). Fuel is then automatically transferred to the inboard section through a float actuated valve (Ref. 28-27-00).

Dual boost pump motor and impeller elements (Ref. 28-24-00) are contained in canister type housings secured to the lower wing skin, and may be replaced from underwing locations without defueling the tank. To assure availability of fuel to the engine fuel feed system under all anticipated aircraft attitudes and at lower fuel tank levels, each pump unit is installed in a surge box reservoir having a fuel capacity of approximately 1000 pounds (454 Kilograms). Fuel is retained in the surge boxes by flapper type check valves installed in the surge box walls.

Baffle plates assure that the boost pump inlet ports are always immersed in fuel. A fuel scavenge system incorporating single and compound jet ejector pumps powered by motive fuel supplied by the boost pumps continually draws fuel from the lowest (sump) areas of the tanks and dumps it into the baffled portion of the surge boxes. In the process of performing this function, the scavenge system transfers any water that may have collected in the lower tank areas to the boost pump inlets where it can be pumped into the engine fuel feed system and consumed in the engines. In addition, the fuel scavenge system continually evacuates fuel from the tank vent collector boxes, precluding

spillage of fuel from the wingtip vents. This fuel is picked up by two compound jet ejector pumps in the tank No. 2L and 2R outboard sections and is routed along with fuel scavenged from the outboard side of the tank separation rib to the fuel low-level transfer manifold and, until such time as transfer of fuel to the inboard section is initiated, is returned to the outboard section.

Since the motive fuel flow which operates the outboard section compound ejector pumps is inboard section fuel pumped to the ejectors by the fuel boost pumps, a continuous transfer of fuel to the outboard section occurs whenever the pumps are operating. Fuel that may have migrated to the inboard section while the aircraft is parked, is thus returned to the outboard section. The scavenge system thus performs the additional function of restoring and maintaining the scheduled fuel load distribution between the tank 2L/2R inboard and outboard sections.

All wing-installed fuel distribution piping and manifolds are installed within the tank boundaries. Any fuel leakage that might occur from the piping and manifold interconnect couplings is thus confined harmlessly to the internal tank areas.

A tank venting systems interconnects each tank to vent boxes in each wing tip and is described in Section 28-13-00.

Fuel system fueling and defueling valves consist of valve assembly housings and line replaceable plug-in elements containing the operational flow control and actuator portions of the valve assembly. Wing tank valve housings are mounted internally in the tanks on the wing spars and installed as part of the fuel distribution piping. Plug-in elements are accessible from locations outside of the tank and may be replaced without defueling.

Fueling valve housings for tanks No. 1A and 3A are mounted on the forward side of the wing center section aft beam. Plug-in elements for these valves are accesible from the main landing gear wheel wells.

Fifteen fuel quantity transmitter probes (Ref. 28-41-00) are installed in each wing: six in tanks 1 and 3, five in each tank 2L and 2R inboard section, and four in each tank 2L and 2R outboard section. Probes are inserted through holes in the upper skin panel and flange mounted to support rings permanently installed at each hole. Probes are identified by location numbers embossed in the probe support base, probe number 1 being the most outboard probe in the wing.

Two fuel quantity transmitter probes (Nos. 16 and 17) are internally mounted in tank 1A, and two in tank 3A.

Six fuel level sight gages (Ref. 28-41-00) are installed in each wing tank; two in tanks 1 and 3, three in tank 2L and 2R inboard sections, and one in the extreme outboard corner of tank 2L and 2R outboard sections. Sight gage support bases are flange mounted to the lower wing skin panels. In operation, a calibrated fuel level measuring stick is unlatched and allowed to extend below the wing to a point where it is magnetically coupled to a float surrounding the stick housing. One fuel level sight gage is installed in tank 1A, and one in tank 3A in the same manner as the wing tank sight gages. The calibrated sticks for these gages, however, extend downward through the keelson to accessible locations beneath the fuselage.

R Five fuel and condensate drain valves (Ref. 28-41-00) are
R installed in the lower wing skin panels of each wing tank: two
R valves are in tank 1 and 3, three in tank 2L and 2R inboard
R sections, and one in each tank 2L and 2R outboard section. A
R significant feature of each valve is the incorporation of
R primary and secondary valve poppets. This permits replacement
R of a leaking primary poppet seal without loss of fuel.

R One fuel and condensate drain valve is installed in each of the
R wing center section tanks 1A and 3A. A probe located in a drain
R tube connected to the valve primary poppet assembly extends
R downward through the keelson and enables valve operation from a
R location beneath the fuselage.

R Overwing manual fueling hose receptacles (Ref. 28-21-00) are
R installed in the upper wing surface of tanks No. 2L and 2R. One
R receptacle is provided for each tank section. There are no
R overwing provisions for fueling tank 1 and 3, or tank 1A and 3A.
R Fueling of these tanks is accomplished by on-the-ground transfer
R of fuel from the outboard tanks.

2. Fuel Tank Access Covers

A. Description

Access to wing fuel tanks and wingtip vent boxes is acquired by removing one or more of 20 access covers installed in the lower wing surface and one or more of 3 access covers in the wing upper surface (Ref. Fig. 1 and 2). The three access covers in each upper wing surface provide access to tank fuel level control switches and vent valves and to the vent collector boxes. Cover plates provide access to the fuel boost pump plug-in elements. Figure 3 shows the relationship of the various access holes and nearby wing ribs.

Lower wing surface access covers are mounted inside the wing and are retained with one-quarter inch diameter screws. The

screws are inserted through clamp rings and wing skin, and are threaded into self-locking floating nuts installed in the access cover (Ref. 57-33-00).

Upper wing surface access covers (Ref. 57-33-01) are mounted on the outside of the wing skin and retained by screws that thread into a clamp ring mounted internally in the tank. The clamp ring is prevented from falling inward by four retainers. Provisions are provided for installation of a handle to aid in removal of the covers.

Access to wing center section tanks (Ref. Fig. 1 and 2) is acquired by entering the wing center section box beam through access holes 141AZ or 147AZ and removing the applicable Tank 1A or 3A access panel in the FS1103 or FS1163 center section beam.

3. Flapper Check Valves

A. Description and Operation

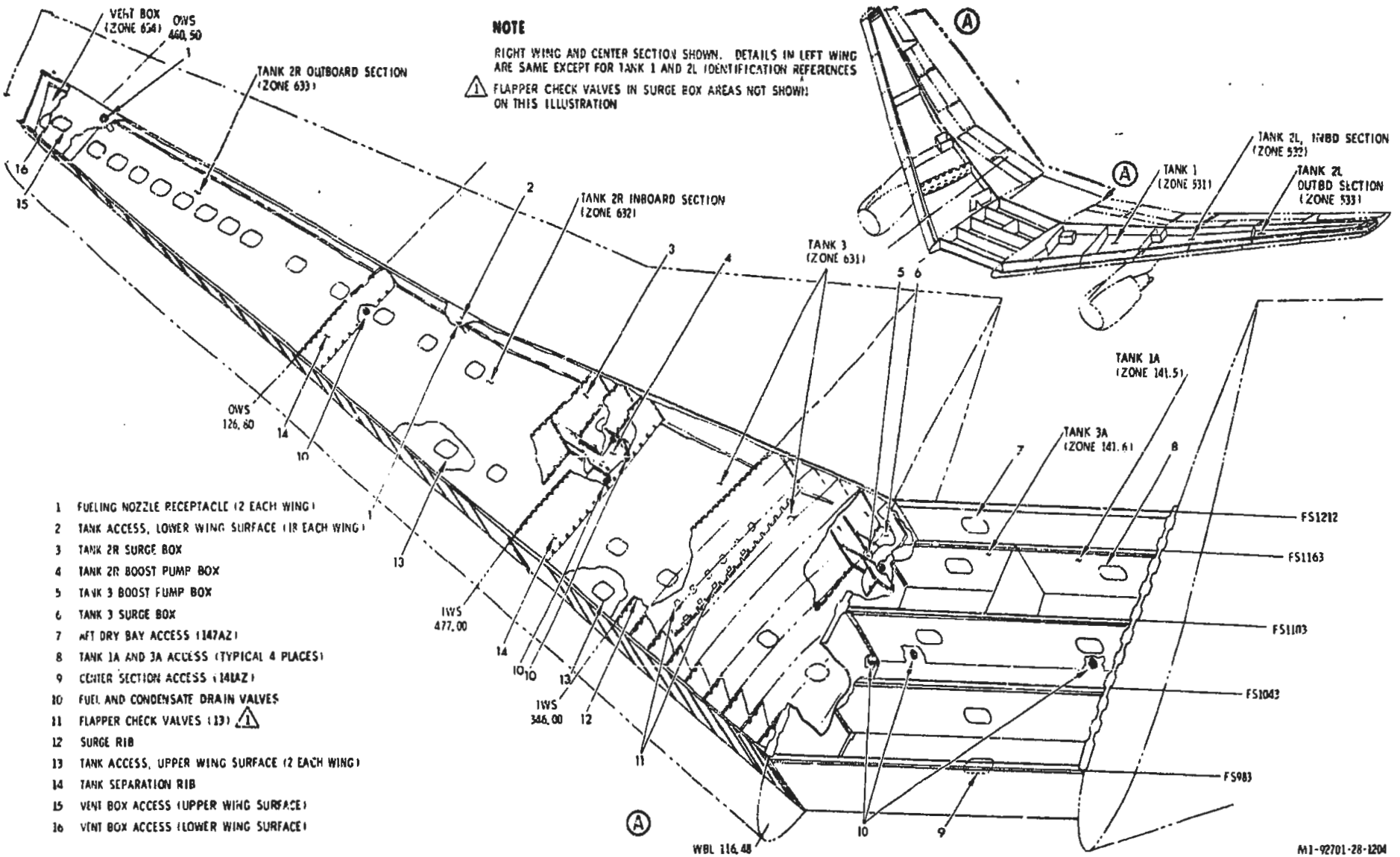
Flapper check valves (Ref. Fig. 3, 4, and 5) are located in each wing tank surge box and on the inner wing station 346.00 surge rib. The check valves installed on the surge box reservoir walls serve in conjunction with the fuel scavenge system in keeping the fuel feed boost pumps submerged under all flight attitudes. The check valves located on the tank 1 and 3 surge ribs serve to retain fuel at the inboard ends of these tanks during low wing attitudes.

Surge box and surge rib flapper check valves consist of a hinged circular or rectangular plate and a body having a seat for the plate to bear against, and provisions for attaching the body to the tank structure. The assembly is mounted vertically over a matching hole in the supporting structure in a position that allows the plate to free fall against the valve seat. Fuel flow through the valve is restricted by contact between plate and seat. Valve open and close positions are determined by differential forces of fuel flowing toward or away from the valve flapper.

Flapper check valves installed at the outlet ports of the compound jet ejector pumps in tank 2L and 2R function in the same manner as noted above.

4. Wing Tank Fuel Scavenge System

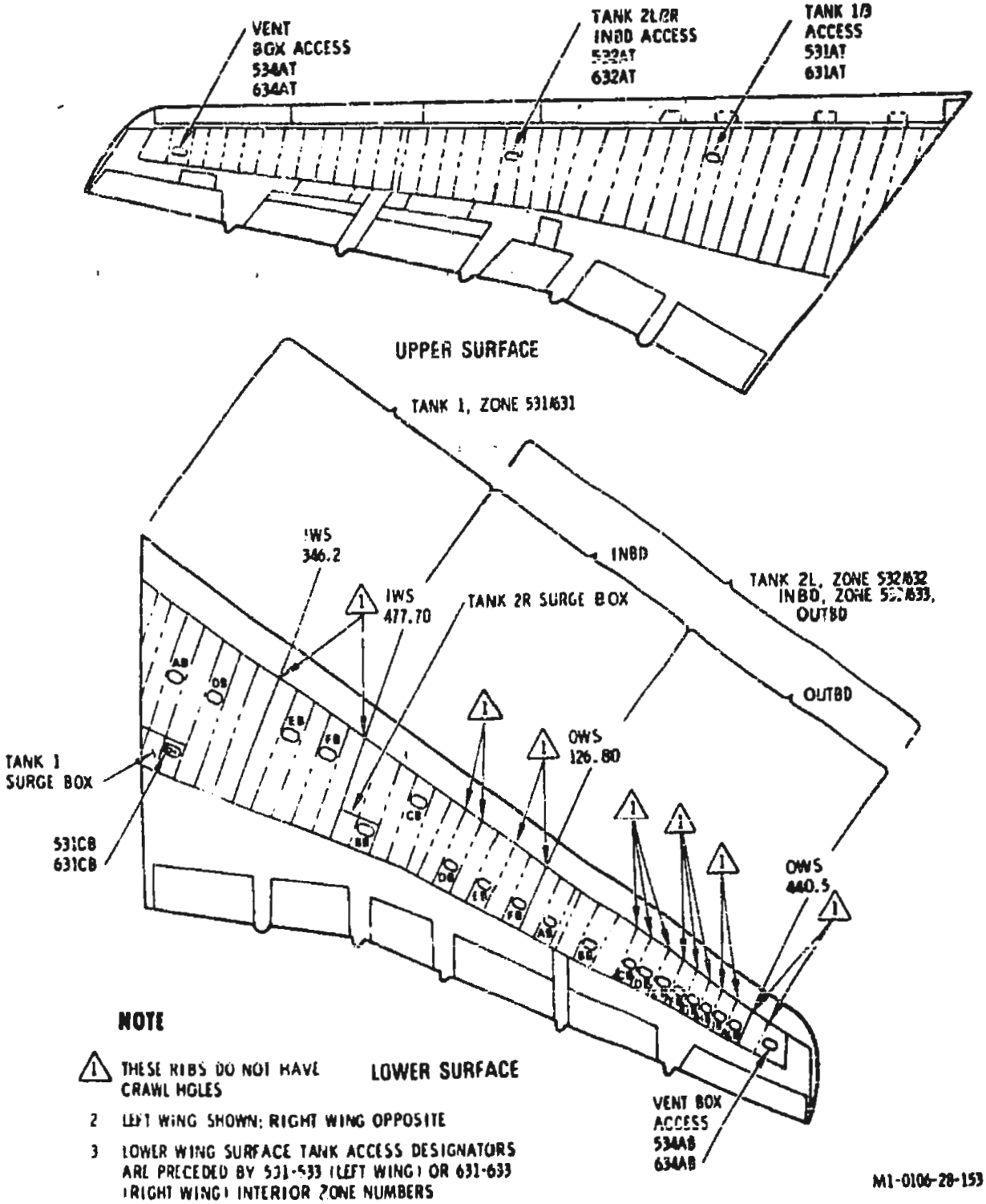
A. Description and Operation


NOTE
RIGHT WING AND CENTER SECTION SHOWN. DETAILS IN LEFT WING ARE SAME EXCEPT FOR TANK 1 AND 2L IDENTIFICATION REFERENCES
1 FLAPPER CHECK VALVES IN SURGE BOX AREAS NOT SHOWN ON THIS ILLUSTRATION
VENT BOX (ZONE 654)
OWS 460.50
TANK 2R OUTBOARD SECTION (ZONE 633)
TANK 2R INBOARD SECTION (ZONE 632)
TANK 3 (ZONE 631)
TANK 2L, INBD SECTION (ZONE 532)
TANK 1 (ZONE 531)
TANK 2L OUTBD SECTION (ZONE 533)
TANK 1A (ZONE 141.5)
TANK 3A (ZONE 141.6)
OWS 126.60
IWS 477.00
IWS 346.00
FS1212
FS1163
FS1103
FS1043
FS983
WBL 116.48
A
1 FUELING NOZZLE RECEPTACLE (2 EACH WING)
2 TANK ACCESS, LOWER WING SURFACE (18 EACH WING)
3 TANK 2R SURGE BOX
4 TANK 2R BOOST PUMP BOX
5 TANK 3 BOOST PUMP BOX
6 TANK 3 SURGE BOX
7 AFT DRY BAY ACCESS (147AZ)
8 TANK 1A AND 3A ACCESS (TYPICAL 4 PLACES)
9 CENTER SECTION ACCESS (141AZ)
10 FUEL AND CONDENSATE DRAIN VALVES
11 FLAPPER CHECK VALVES (13) 1
12 SURGE RIB
13 TANK ACCESS, UPPER WING SURFACE (2 EACH WING)
14 TANK SEPARATION RIB
15 VENT BOX ACCESS (UPPER WING SURFACE)
16 VENT BOX ACCESS (LOWER WING SURFACE)
M1-92701-28-1204

Fuel Tanks
Figure 1

R EFFECTIVITY: 025-026, 028-999
R

0028



NOTE

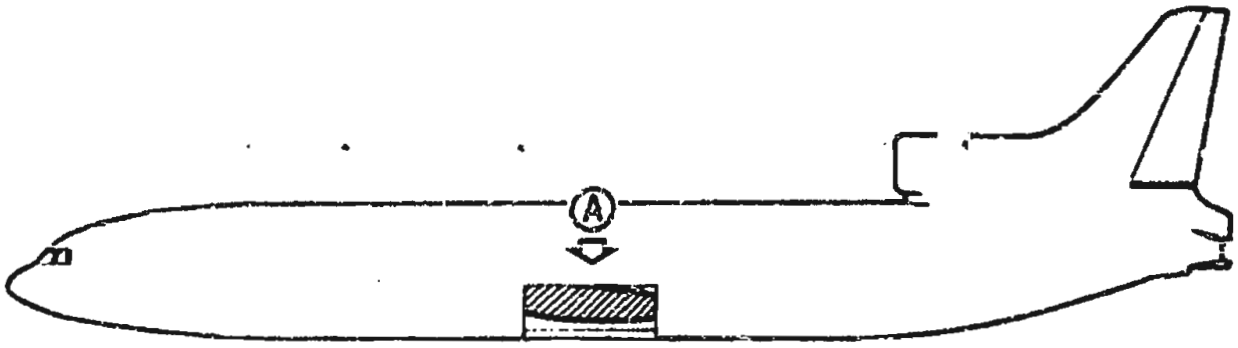
1. THESE RIBS DO NOT HAVE CRAWL HOLES
2. LEFT WING SHOWN; RIGHT WING OPPOSITE
3. LOWER WING SURFACE TANK ACCESS DESIGNATORS ARE PRECEDED BY 531-533 (LEFT WING) OR 631-633 (RIGHT WING) INTERIOR ZONE NUMBERS

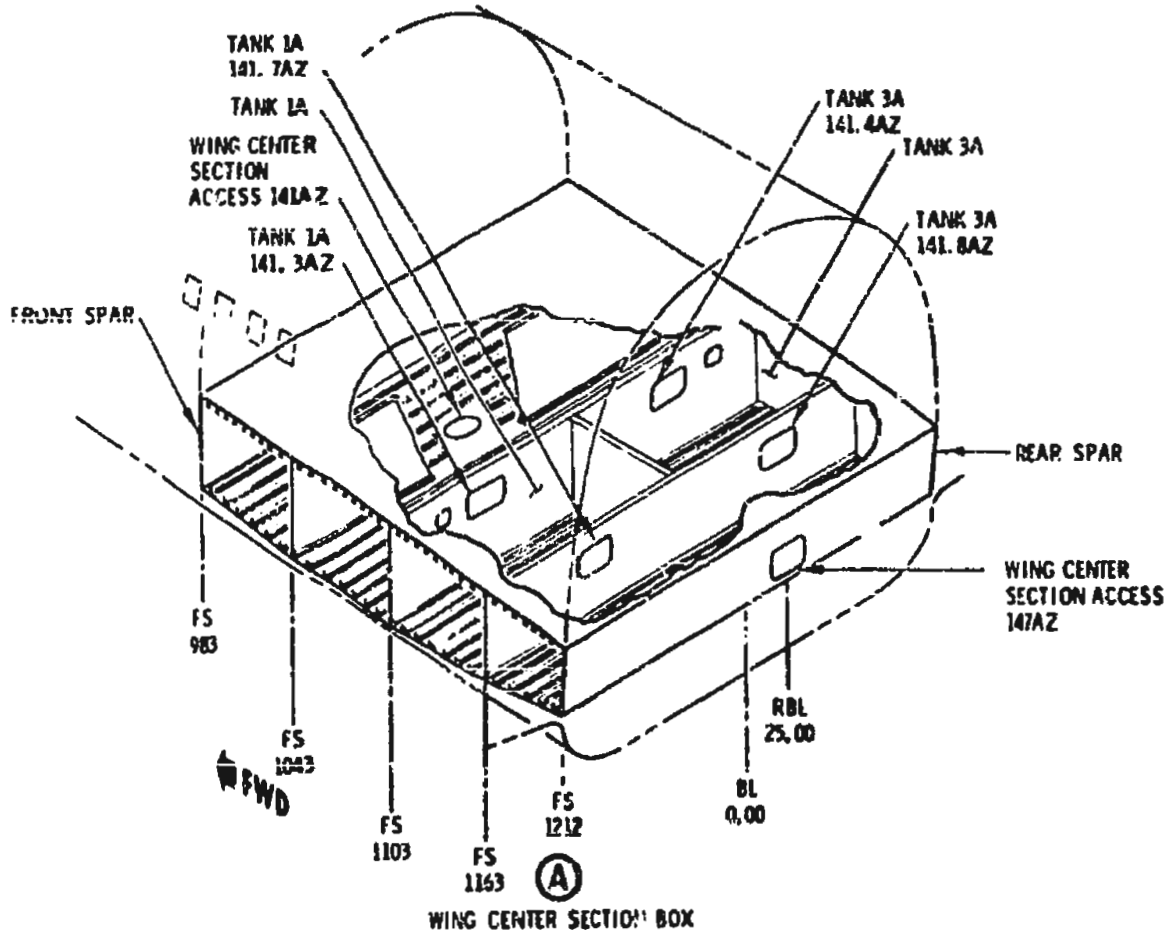
M1-0106-28-153

R
R

Fuel Tank Access Covers
Figure 2 (Sheet 1)

EFFECTIVITY: 025-026, 028-999

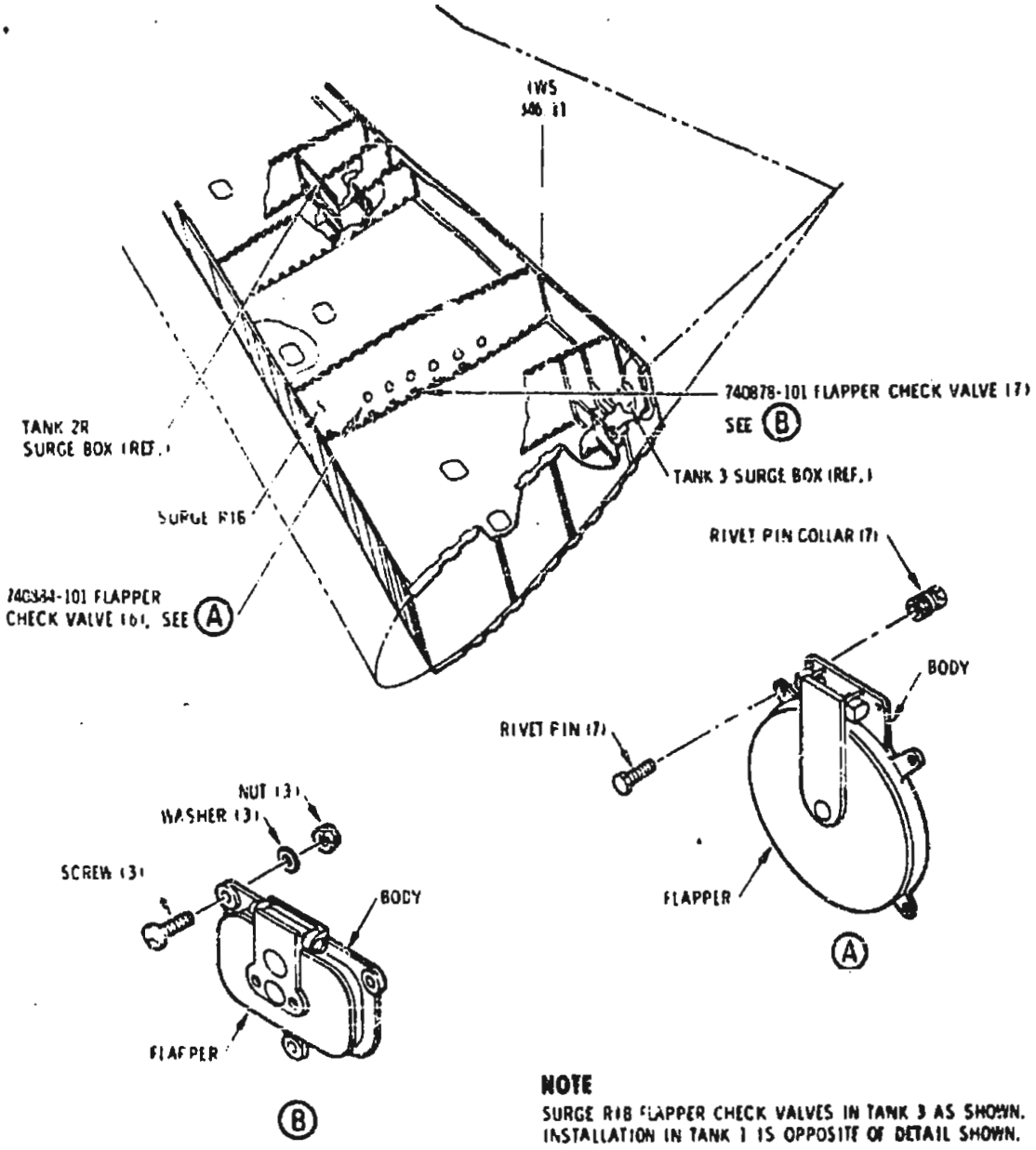




WING CENTER SECTION BOX

MI-92701-28-1175

Fuel Tank Access Covers
Figure 2 (Sheet 2)

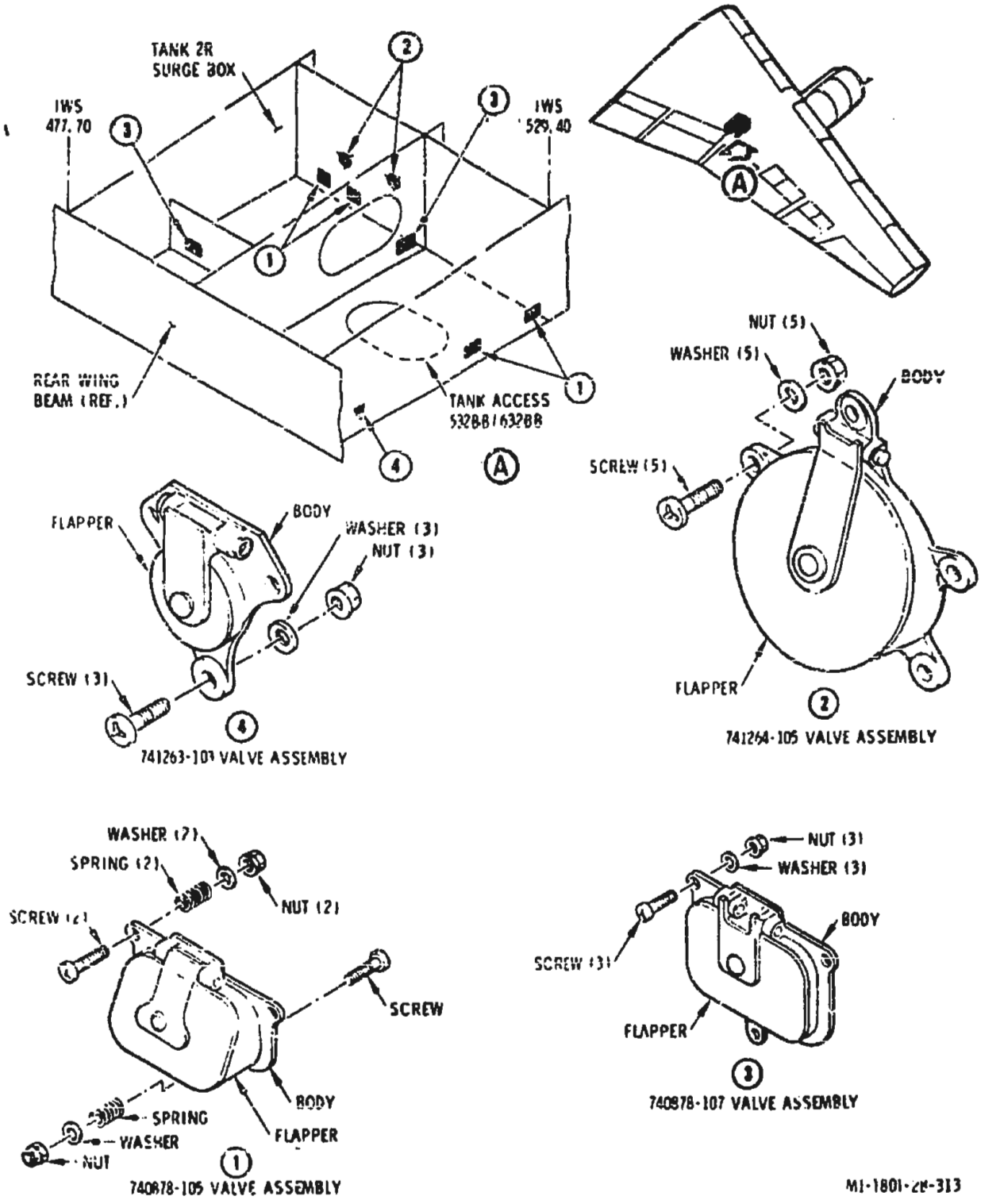


NOTE

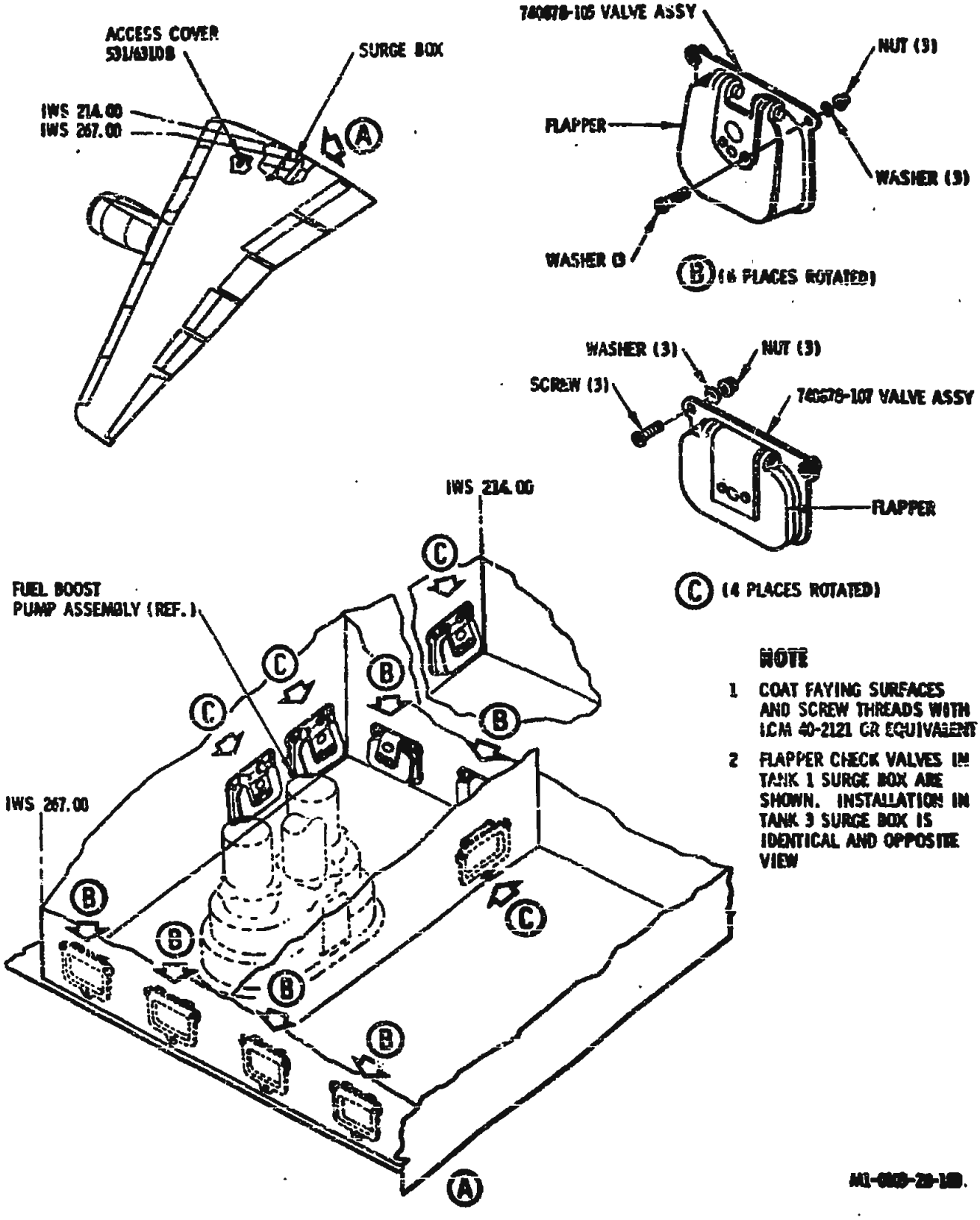
SURGE RIB FLAPPER CHECK VALVES IN TANK 3 AS SHOWN. INSTALLATION IN TANK 1 IS OPPOSITE OF DETAIL SHOWN.

MI-0100-28-314

Flapper Check Valves, Tank 1 and 3 Surge Ribs
Figure 3



Flapper Check Valves, Tank 2L and 2R
Figure 4



NOTE

1. COAT FAYING SURFACES AND SCREW THREADS WITH LCM 40-2121 OR EQUIVALENT
2. FLAPPER CHECK VALVES IN TANK 1 SURGE BOX ARE SHOWN. INSTALLATION IN TANK 3 SURGE BOX IS IDENTICAL AND OPPOSITE VIEW

M1-[illegible]-28-1[illegible].

Flapper Check Valves, Tank 1 and 3
Figure 5

A fuel scavenge system (Ref. Fig. 6 through 9) consisting of single and compound jet ejector pumps (Ref. Fig. 6), check valves, flapper check valves, and associated piping, is installed in each tank.

The scavenge system performs five important functions:

(1) It continually removes water that collects in the remote low (sump) areas of the tanks, thereby retarding microbiological growth.

(2) It removes fuel sloshed into the vent collector boxes during taxi turns and other maneuvers.

(3) It continually draws fuel from the low tank areas and dumps this fuel into the boost pump surge boxes thereby assuring that the pump inlets are submerged under all normal flight attitudes.

(4) It significantly reduces the amount of unusable fuel in the tanks.

(5) It returns fuel from the inboard to outboard sections of tanks 2L and 2R at approximately 100 lbs per minute, thereby maintaining correct fuel distribution levels in the two sections.

Four large (single nozzle) and two small (single nozzle) fuel ejector pumps are installed in each of the tank 1 and 3 boost pump surge boxes. Induced flow (fuel pickup) tubing attached to these pumps is routed to the low (sump) areas at the wing root rib and aft spar just outboard of the surge box. Five compound ejector pumps each an assembly of five small nozzle ejectors clustered in a single unit having a common motive fuel flow inlet port are installed in each of the 2L and 2R outboard tanks. Two of the pumps are attached to forward side of the surge box forward partition and one on the aft wall of the boost pump well next to a large (single nozzle) pump. Flapper check valves at the outlet ports of these pumps inhibit reverse flow (syphoning) of fuel out of the boost pump well when the boost pumps are off. The remaining two compound pumps are installed in the outboard tank section on the OWS 126.00 tank divider rib. The induced flow tubing to these pumps is routed along the outboard side of the rib to tank low areas between the lower tank surface stringers. Fuel picked up by these pumps is routed into a common manifold connected to the tank low fuel transfer manifold and is dumped into the inboard section surge box area through the float actuated fuel transfer valve (Ref. 28-27-00).

An additional small nozzle ejector pump is located on the outboard side of IWS 529.40 wing rib. This pump picks up the fuel that would remain in this area when fuel levels are low and ejects its combined motive and induced fuel through a flapper check valve into the tank surge box.

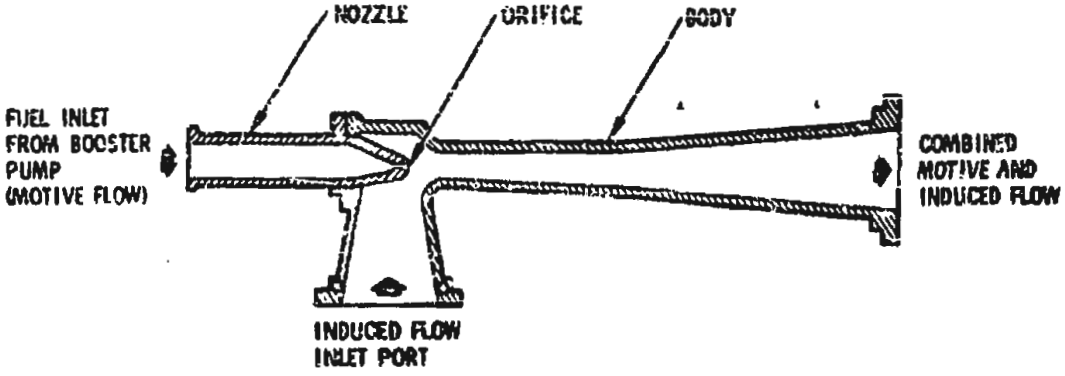
Operation of the scavenge system is based on the jet pump effect created by motive fuel flow through a venturi which induces, by aspiration, a secondary flow of fuel through pickup lines routed to various low points in the tank. Fuel which would otherwise remain in these areas as unusable fuel is thus made available to the engine fuel feed system. Motive fuel flow is supplied by the engine fuel feed boost pumps through a screen and check valve mounted in the discharge chamber of the boost pump canister.

The system thus operates in conjunction with the surge box flapper check valves (and transfer valves in tank 2L and 2R) in assuring that the maximum amount of usable fuel is made available at the boost pump inlets. An additional important function performed by the scavenge system is to continually withdraw fuel from the vent collector boxes, thus precluding spillage out of the wingtip vents. This fuel is picked up by induced flow tubes attached to the two compound ejectors in the tank 2L and 2R outboard compartments and routed along with induced fuel flow from the low tank areas just outboard of the tank separation rib to the fuel transfer manifold.

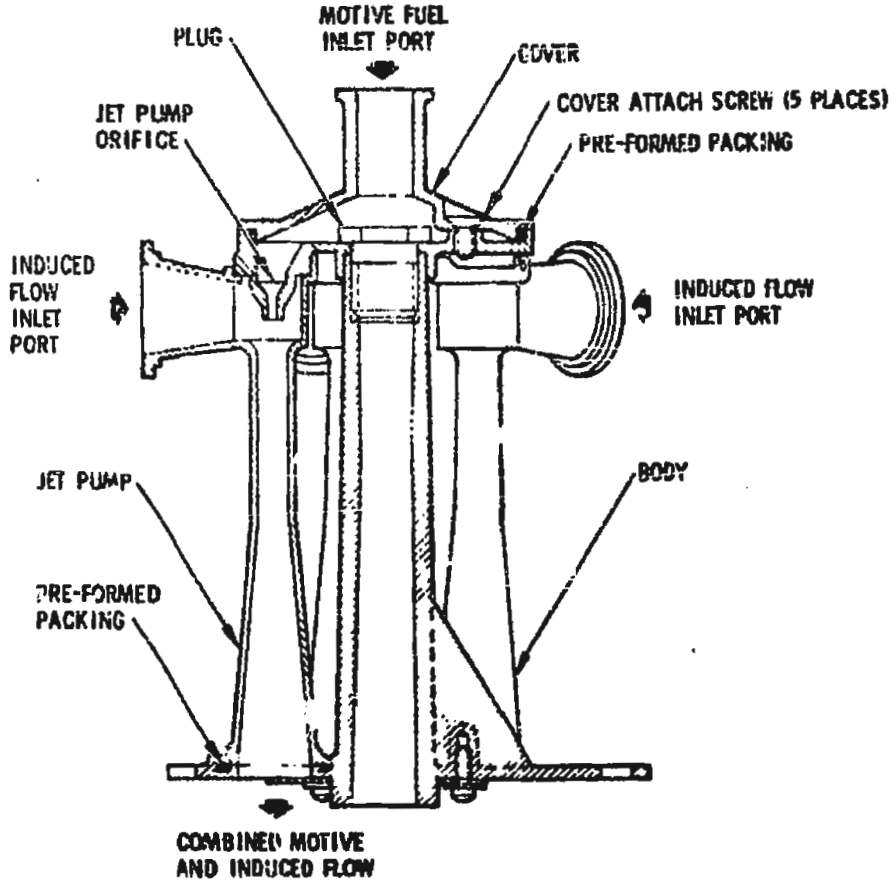
5. Center Section Tank Fuel Scavenge System

A. Description and Operation

To minimize the amount unusable fuel and prevent accumulation of water in low areas of wing center section tanks 1A and 3A, fuel is continuously transferred at a low rate from these areas into the respective tank 1 and 3 surge boxes. This fuel transfer is accomplished by a scavenge system comprising one compound fuel ejector pump and one small (single nozzle) ejector pump in each tank, and a motor-actuated motive flow scavenge valve (one for each tank) located on the center section rear beam in each MLG wheel well (Ref. Fig. 6 and 7). Motive fuel for operating the system is derived from the boost pump assemblies in the respective tanks 1 and 3. To prevent a redistribution of fuel loading that would occur during ground operations, the tank 1A and 3A motive flow scavenge valves are automatically controlled by the No. 1 and 6 air ground sensing relays 3263-K1 and K6 (Ref. Fig. 9). Motive fuel is then supplied to the fuel scavenge ejector pumps only when the aircraft is airborne.



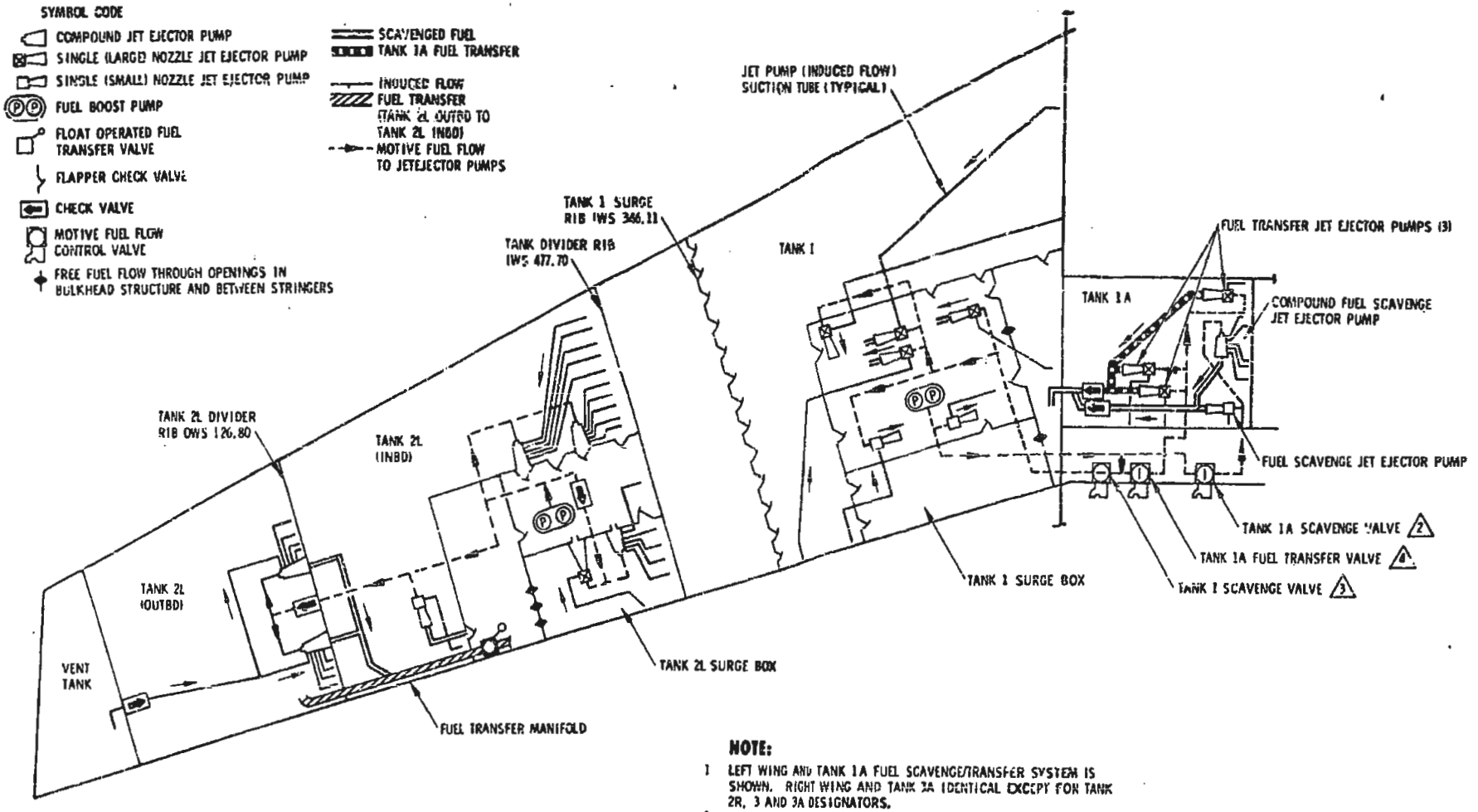
SINGLE NOZZLE JET EJECTOR PUMP



COMPOUND JET EJECTOR PUMP

M1-0100-28-1362

Jet Ejector Pumps
Figure 6


SYMBOL CODE
COMPOUND JET EJECTOR PUMP
SINGLE (LARGE) NOZZLE JET EJECTOR PUMP
SINGLE (SMALL) NOZZLE JET EJECTOR PUMP
FUEL BOOST PUMP
FLOAT OPERATED FUEL TRANSFER VALVE
FLAPPER CHECK VALVE
CHECK VALVE
MOTIVE FUEL FLOW CONTROL VALVE
FREE FUEL FLOW THROUGH OPENINGS IN BULKHEAD STRUCTURE AND BETWEEN STRINGERS
SCAVENGED FUEL
TANK 1A FUEL TRANSFER
INDUCED FLOW
FUEL TRANSFER (TANK 2L OUTBD TO TANK 2L INBD)
MOTIVE FUEL FLOW TO JETEJECTOR PUMPS
JET PUMP (INDUCED FLOW) SUCTION TUBE (TYPICAL)
TANK 1 SURGE RIB WS 346.11
TANK DIVIDER RIB WS 477.70
TANK 1
TANK 1A
FUEL TRANSFER JET EJECTOR PUMPS (3)
COMPOUND FUEL SCAVENGE JET EJECTOR PUMP
FUEL SCAVENGE JET EJECTOR PUMP
TANK 1A SCAVENGE VALVE 2
TANK 1A FUEL TRANSFER VALVE 4
TANK 1 SCAVENGE VALVE 3
TANK 1 SURGE BOX
TANK 2L DIVIDER RIB WS 126.80
TANK 2L (INBD)
TANK 2L (OUTBD)
TANK 2L SURGE BOX
VENT TANK
FUEL TRANSFER MANIFOLD

NOTE:

1 LEFT WING AND TANK 1A FUEL SCAVENGE/TRANSFER SYSTEM IS SHOWN. RIGHT WING AND TANK 2A IDENTICAL EXCEPT FOR TANK 2R, 3 AND 3A DESIGNATORS.

2 NORMALLY CLOSED, OPEN WHEN AIRCRAFT IS AIRBORNE.

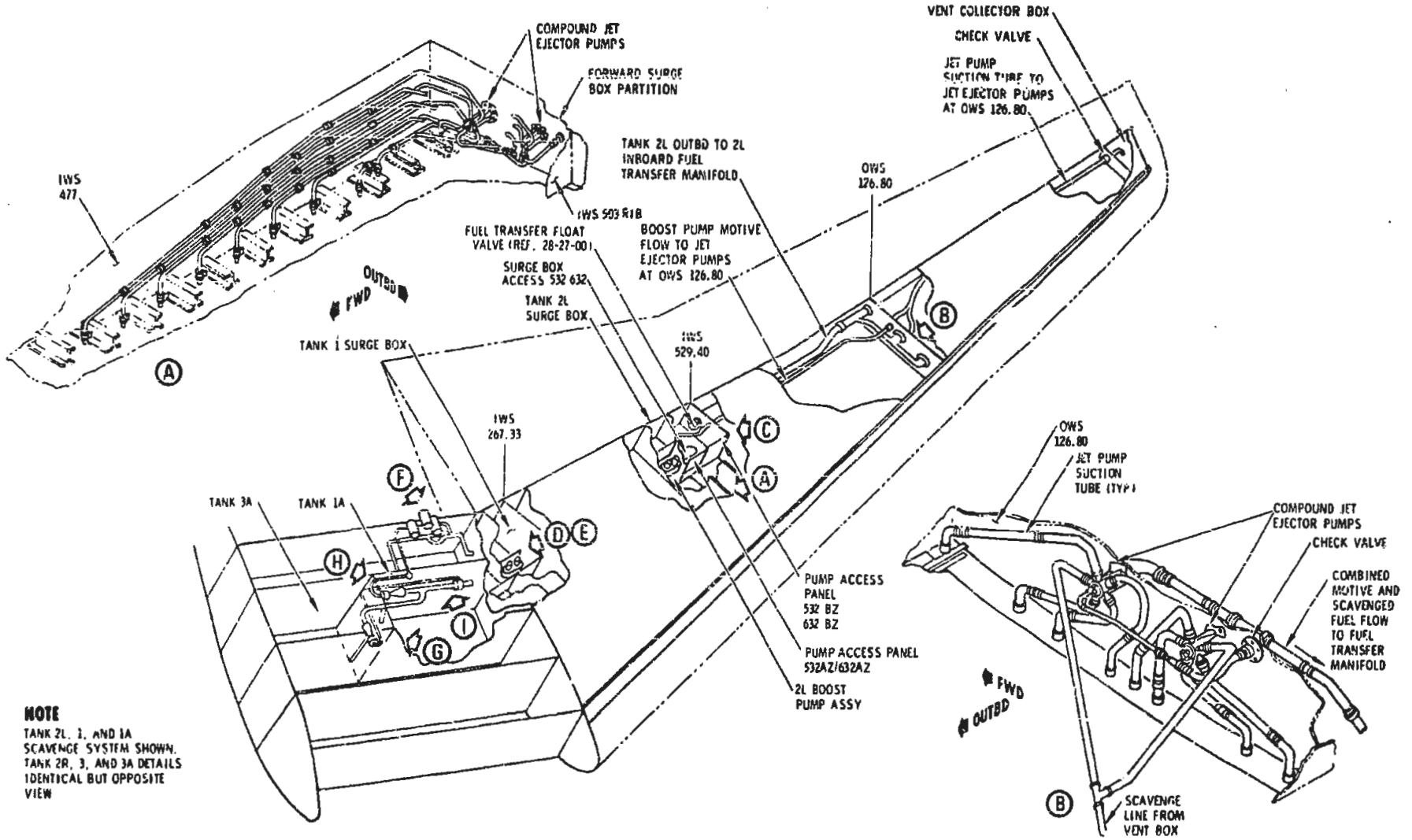
3 NORMALLY OPEN; CLOSES WHEN 1A FUEL TRANSFER VALVE IS OPENED.

4 NORMALLY CLOSED, OPENS WHEN FUEL TRANSFER IS SELECTED. WHEN OPENED IN-FLIGHT, FUEL TRANSFER FLOW RATE IS COMBINED FLOW INDUCED BY BOTH FUEL TRANSFER AND FUEL SCAVENGE JET EJECTOR PUMPS.

M1-0001-28-1359

Fuel Scavenge System Diagram
Figure 7

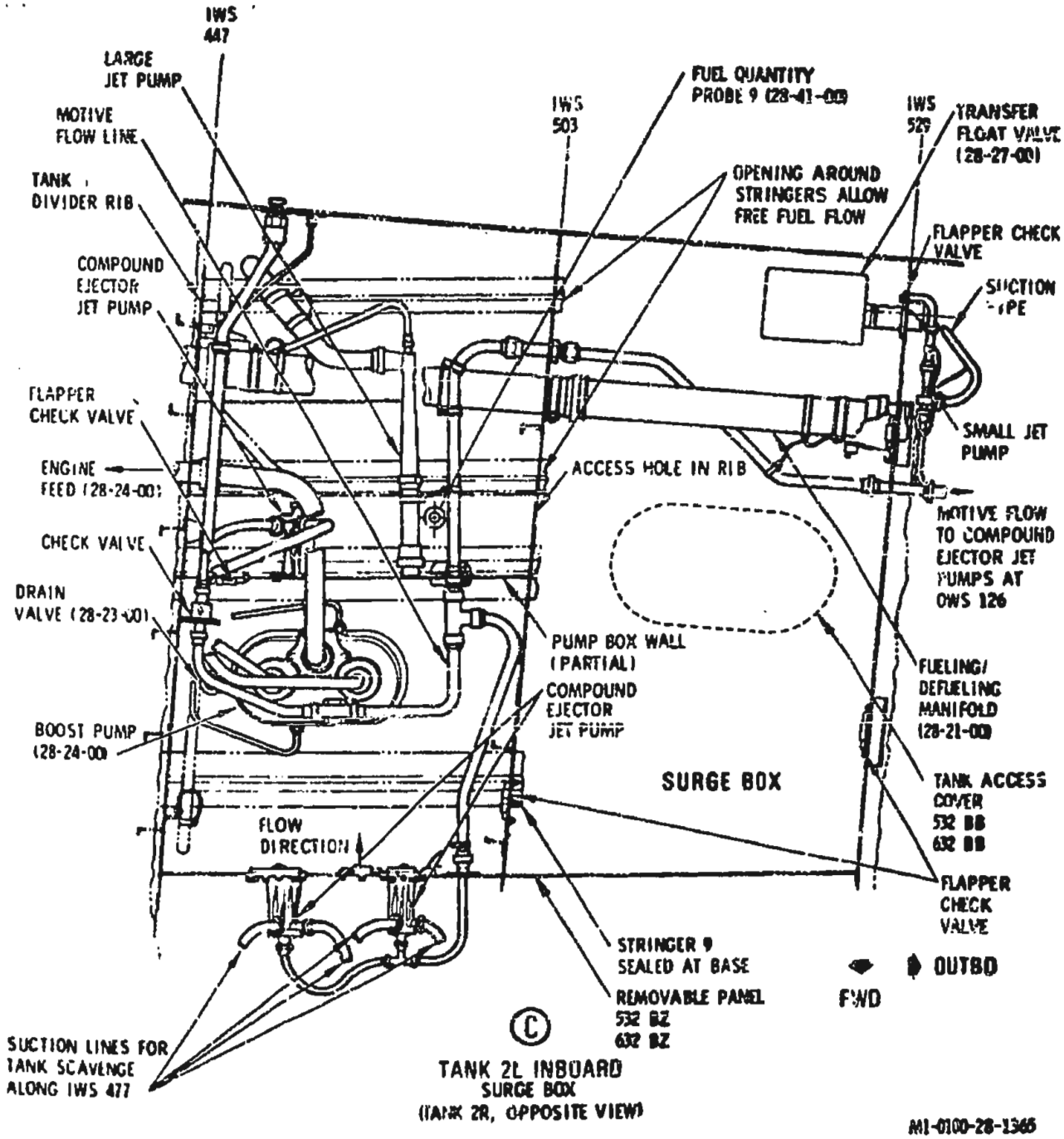
R EFFECTIVITY: 025-026, 028-999
R
0028


COMPOUND JET EJECTOR PUMPS
FORWARD SURGE BOX PARTITION
VENT COLLECTOR BOX
CHECK VALVE
JET PUMP SUCTION TUBE TO JET EJECTOR PUMPS AT OWS 126.80
IWS 477
TANK 2L OUTBD TO 2L INBOARD FUEL TRANSFER MANIFOLD
OWS 126.80
IWS 503 R1B
FUEL TRANSFER FLOAT VALVE (REF. 28-27-00)
BOOST PUMP MOTIVE FLOW TO JET EJECTOR PUMPS AT OWS 126.80
SURGE BOX ACCESS 532 632
OUTBD
FWD
TANK 2L SURGE BOX
TANK 1 SURGE BOX
IWS 529.40
IWS 267.33
TANK 3A
TANK 1A
PUMP ACCESS PANEL 532 BZ 632 BZ
PUMP ACCESS PANEL 532AZ/632AZ
2L BOOST PUMP ASSY
OWS 126.80
JET PUMP SUCTION TUBE (TYP.)
COMPOUND JET EJECTOR PUMPS
CHECK VALVE
COMBINED MOTIVE AND SCAVENGED FUEL FLOW TO FUEL TRANSFER MANIFOLD
FWD
OUTBD
SCAVENGE LINE FROM VENT BOX

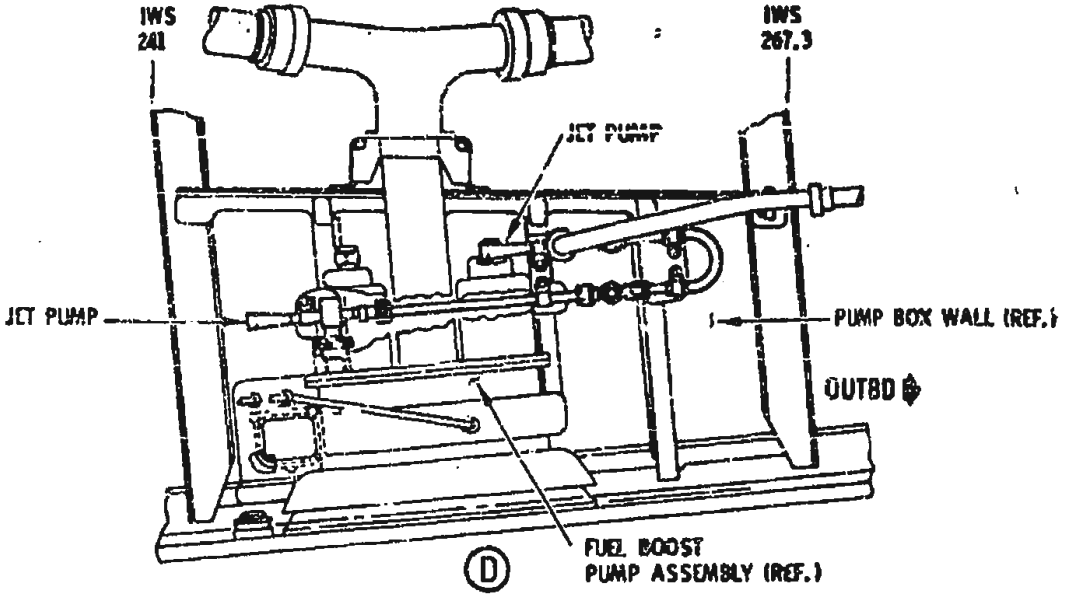
NOTE
TANK 2L, 1, AND 1A SCAVENGE SYSTEM SHOWN. TANK 2R, 3, AND 3A DETAILS IDENTICAL BUT OPPOSITE VIEW

M1-92709-28-1363

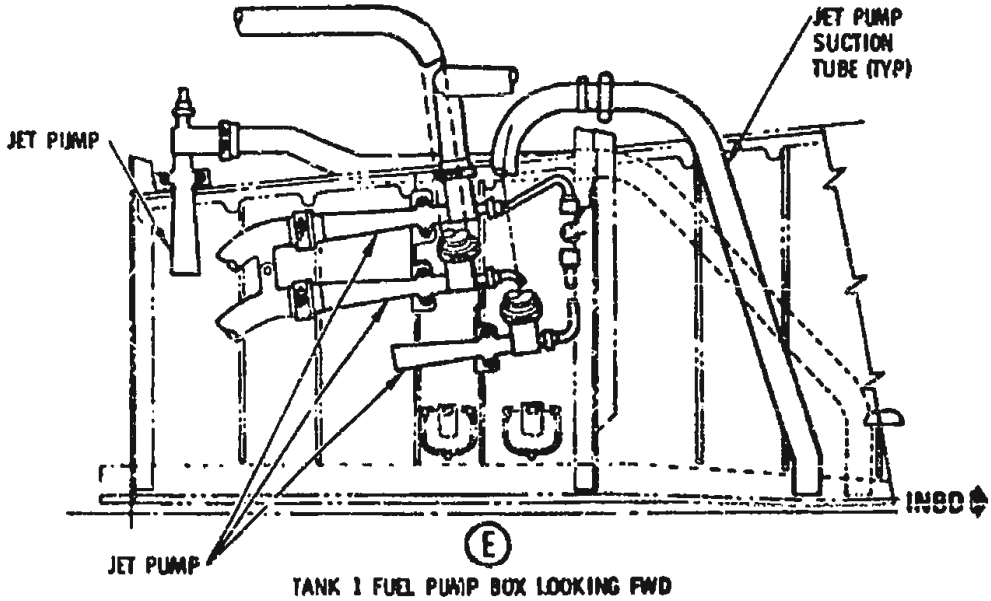
Fuel Tank Scavenge System
Figure 8 (Sheet 1)



Fuel Tank Scavenge System
Figure 8 (Sheet 2)



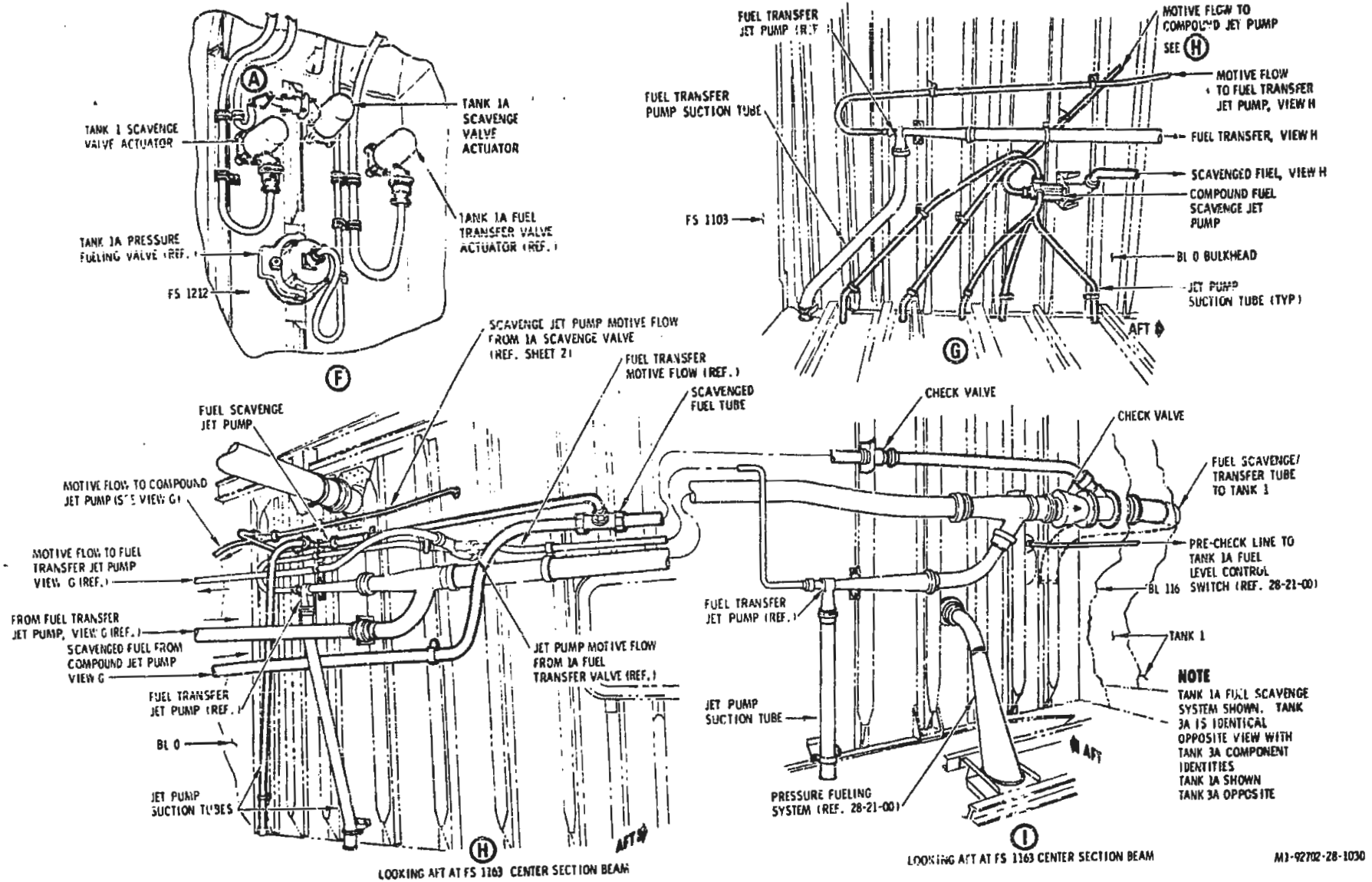
TANK 1 FUEL PUMP BOX LOOKING AFT
(NO. 3 FUEL PUMP BOX IS OPPOSITE VIEW)



TANK 1 FUEL PUMP BOX LOOKING FWD

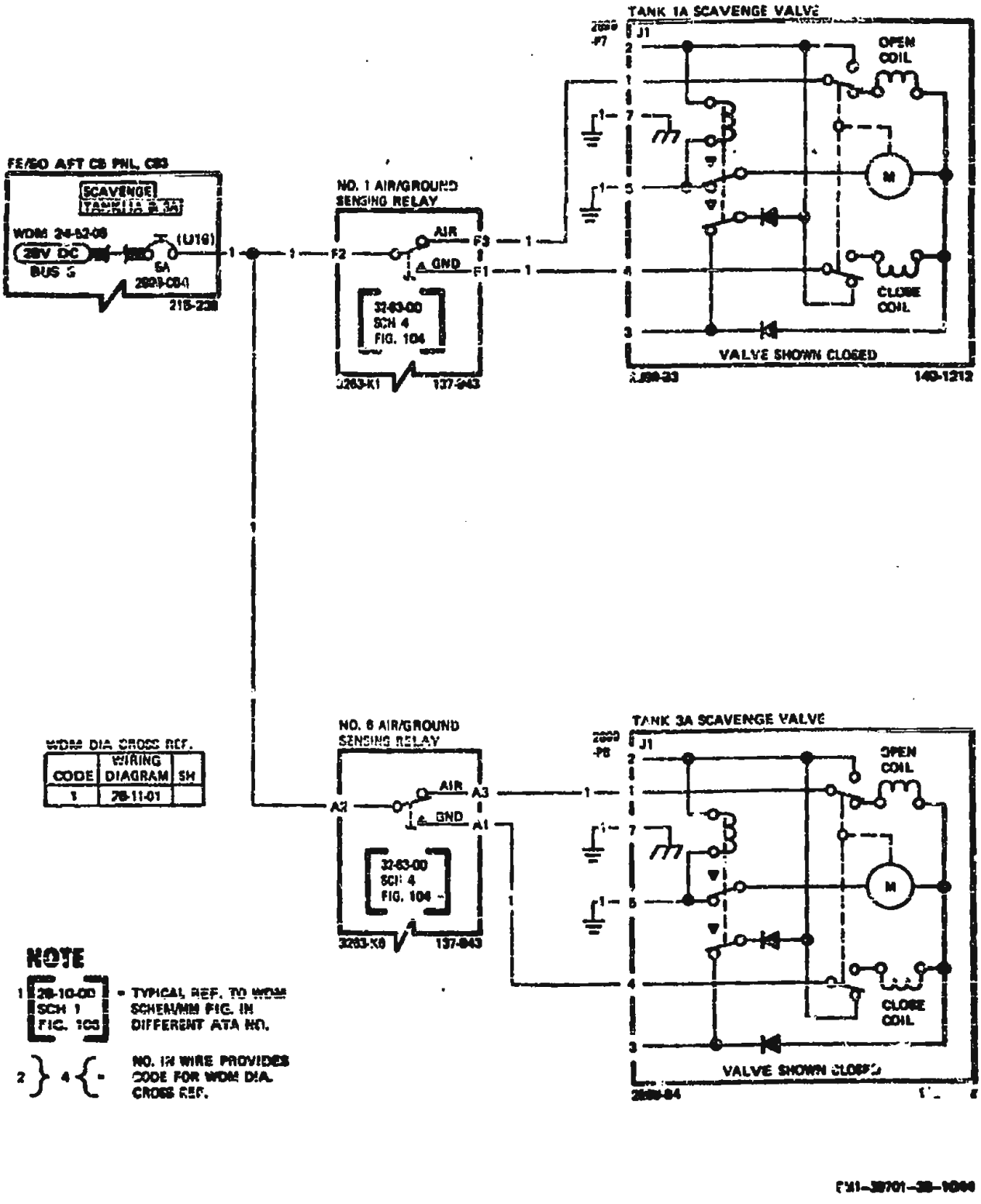
Mi-0100-28-1364

Fuel Tank Scavenge System
Figure 8 (Sheet 3)


TANK 1 SCAVENGE VALVE ACTUATOR
TANK 1A SCAVENGE VALVE ACTUATOR
TANK 1A FUEL TRANSFER VALVE ACTUATOR (REF.)
TANK 1A PRESSURE FUELING VALVE (REF.)
FS 1212
F
FUEL TRANSFER JET PUMP (REF.)
FUEL TRANSFER PUMP SUCTION TUBE
FS 1103
MOTIVE FLOW TO COMPOUND JET PUMP SEE H
MOTIVE FLOW TO FUEL TRANSFER JET PUMP, VIEW H
FUEL TRANSFER, VIEW H
SCAVENGED FUEL, VIEW H
COMPOUND FUEL SCAVENGE JET PUMP
BL 0 BULKHEAD
JET PUMP SUCTION TUBE (TYP)
AFT
G
SCAVENGE JET PUMP MOTIVE FLOW FROM 1A SCAVENGE VALVE (REF. SHEET 2)
FUEL TRANSFER MOTIVE FLOW (REF.)
SCAVENGED FUEL TUBE
FUEL SCAVENGE JET PUMP
MOTIVE FLOW TO COMPOUND JET PUMP SEE VIEW G
MOTIVE FLOW TO FUEL TRANSFER JET PUMP VIEW G (REF.)
FROM FUEL TRANSFER JET PUMP, VIEW G (REF.)
SCAVENGED FUEL FROM COMPOUND JET PUMP VIEW G
FUEL TRANSFER JET PUMP (REF.)
BL 0
JET PUMP SUCTION TUBES
JET PUMP MOTIVE FLOW FROM 1A FUEL TRANSFER VALVE (REF.)
AFT
H
LOOKING AFT AT FS 1163 CENTER SECTION BEAM
CHECK VALVE
CHECK VALVE
FUEL SCAVENGE/ TRANSFER TUBE TO TANK 1
PRE-CHECK LINE TO TANK 1A FUEL LEVEL CONTROL SWITCH (REF. 28-21-00)
BL 116
TANK 1
FUEL TRANSFER JET PUMP (REF.)
JET PUMP SUCTION TUBE
PRESSURE FUELING SYSTEM (REF. 28-21-00)
AFT
NOTE
TANK 1A FUEL SCAVENGE SYSTEM SHOWN. TANK 3A IS IDENTICAL OPPOSITE VIEW WITH TANK 3A COMPONENT IDENTITIES
TANK 1A SHOWN
TANK 3A OPPOSITE
I
LOOKING AFT AT FS 1163 CENTER SECTION BEAM
M1-92702-28-1030

Fuel Tank Scavenge System
Figure 8 (Sheet 4)

EFFECTIVITY: 025-026, 028-999



Tank 1A and 3A Scavenge Valve Control Schematic
Figure 9

The tank 1A/3A fuel scavenge system is essentially an extension of and operates in conjunction with the tank 1A/3A fuel transfer system (Ref. 28-27-00). This system activates three additional large (single nozzle) ejector pumps in each center section tank to increase the rate of fuel transfer into the respective wing tank.

R

TANKS - FAULT ISOLATION

R 1. General

R Reference data and fault isolation procedures for troubleshooting fuel distribution/scavenge system faults are included in this section of the manual. A tank fuel distribution/scavenge system problem detected by the flight crew is normally entered in the aircraft flight log book and reported to maintenance personnel by a FIRM fault code number. This number and the flight log book write-up can be found in the Chapter 28 Fault Code Index. The index specifies the maintenance manual section, fault isolation diagram figure number and, where appropriate, a block number indicating the diagram entry point containing the fault isolation procedure. When no block number is specified, the diagram entry point is block 1.

R Prerequisites listed at the top of each diagram identify mandatory preliminary steps and circuit breakers that must be closed before initiating any fault isolation step.

R Schematic diagrams, identified by a SCHEM number, supplement fault isolation procedures as maintenance aids. The schematics show the basic system circuitry necessary for troubleshooting and include cross-reference indexes to the wiring diagram manual pages required for checking component interconnect wiring.

R 2. Supplemental Data

R Supplementary data includes functional tests, checkout tests, BITE checks and other general information that can be helpful in performing fault isolation. Supplementary data in this section is listed in Table 101.

R Supplemental Data
R Table 101

TABLE/FIGURE NO.	TITLE
Fig. 101	Fuel Scavenge System Diagram
Fig. 102	Tank 2L/2R Fuel Migration Diagram

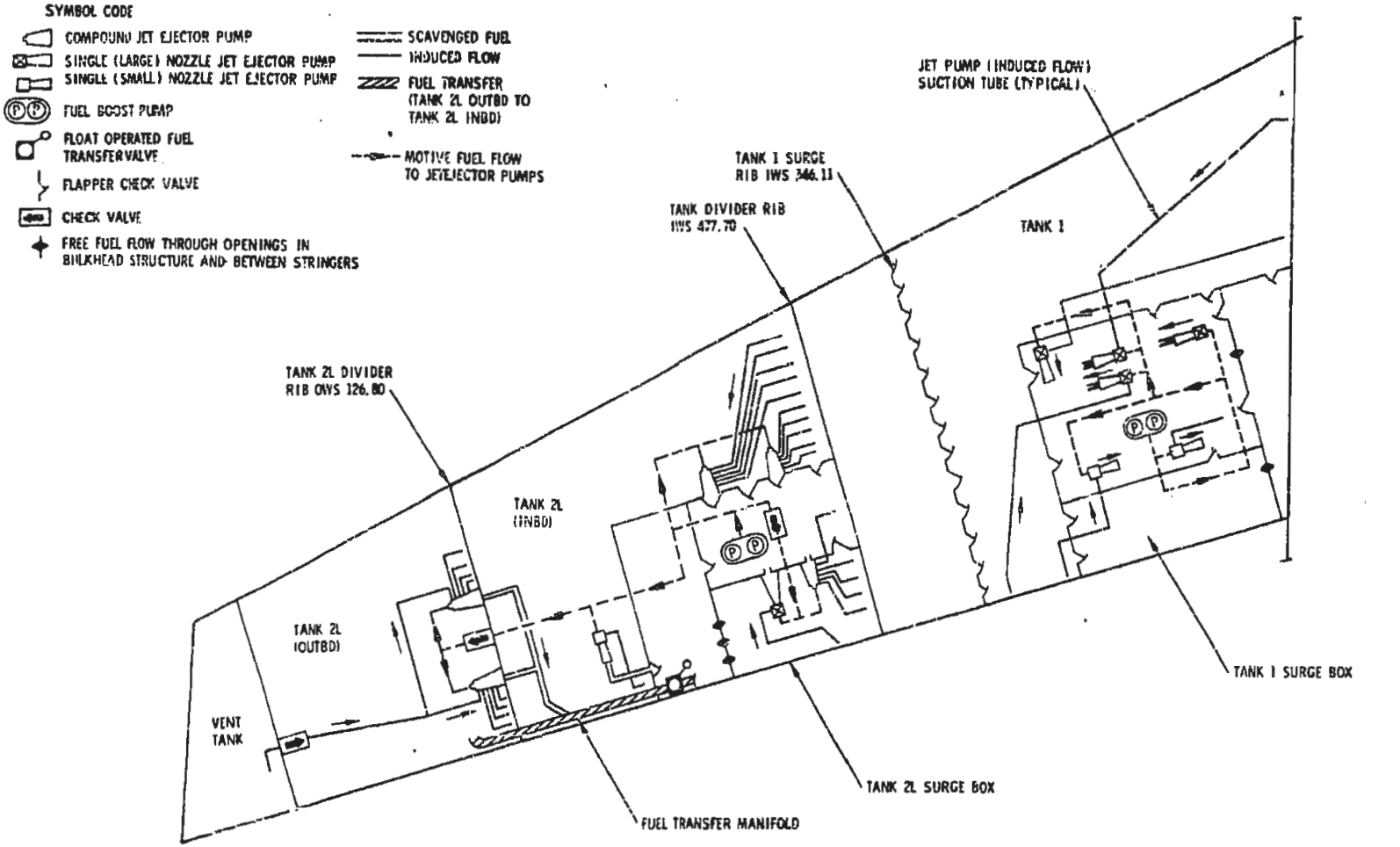
3. Fault Isolation

Table 102 is a list of fault isolation data in this section of the manual.

R For fuel migration from outboard to inboard section of tank 2L
R or 2R, refer to Fig. 105. For all other fuel migration faults,
R refer to appropriate 28-24-00,101 diagram.

Fault Isolation Data
Table 102

FIGURE	TITLE
103	Components Location Index
104	Components Locator
105	Tank 2L/2R Fuel Migration Problems

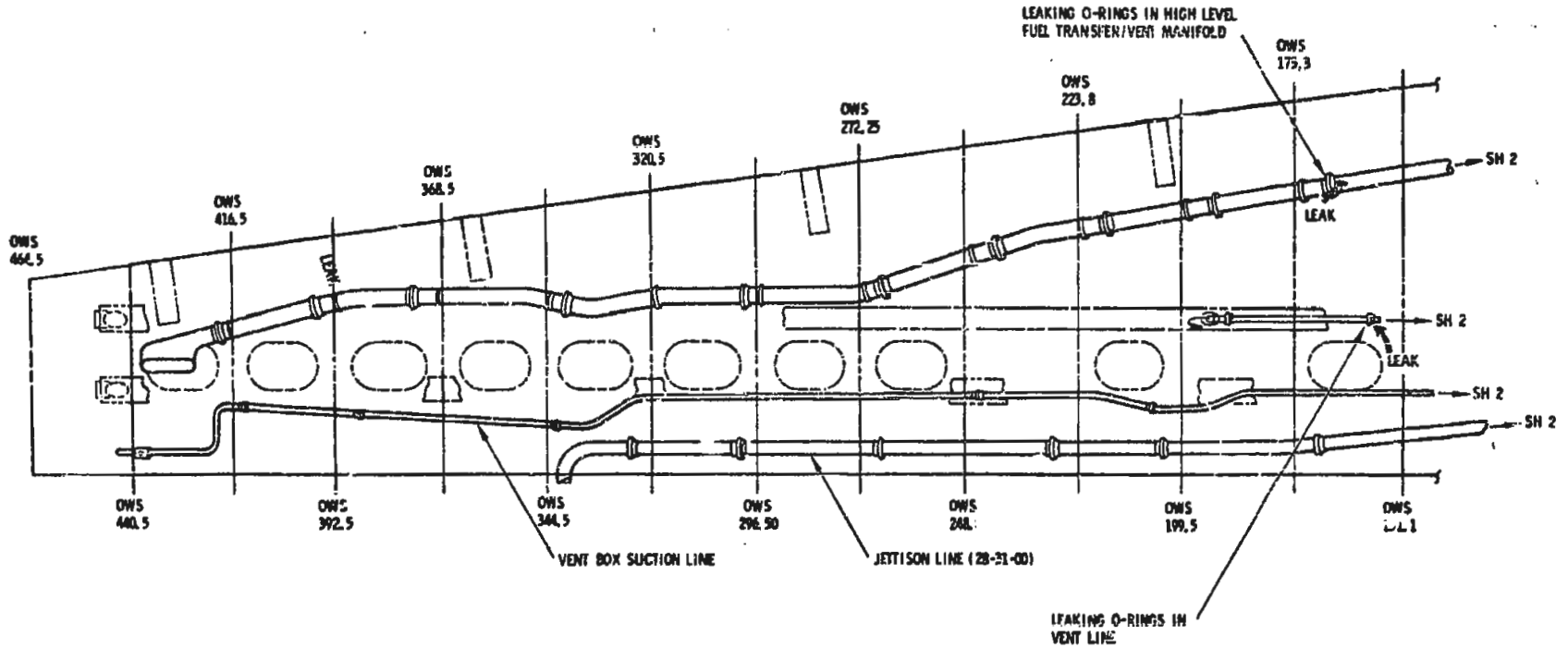

SYMBOL CODE
COMPOUND JET EJECTOR PUMP
SINGLE (LARGE) NOZZLE JET EJECTOR PUMP
SINGLE (SMALL) NOZZLE JET EJECTOR PUMP
FUEL BOOST PUMP
FLOAT OPERATED FUEL TRANSFER VALVE
FLAPPER CHECK VALVE
CHECK VALVE
FREE FUEL FLOW THROUGH OPENINGS IN BULKHEAD STRUCTURE AND BETWEEN STRINGERS
SCAVENGED FUEL
INDUCED FLOW
FUEL TRANSFER (TANK 2L OUTBD TO TANK 2L INBD)
MOTIVE FUEL FLOW TO JETEJECTOR PUMPS
JET PUMP (INDUCED FLOW) SUCTION TUBE (TYPICAL)
TANK 1 SURGE RIB IWS 346.11
TANK DIVIDER RIB IWS 477.70
TANK 1
TANK 2L DIVIDER RIB OWS 126.80
TANK 2L (INBD)
TANK 2L (OUTBD)
VENT TANK
TANK 1 SURGE BOX
TANK 2L SURGE BOX
FUEL TRANSFER MANIFOLD

NOTE:
1 TANK 2L AND 1 FUEL SCAVENGE SYSTEM SHOWN. TANK 2R AND 3 SCAVENGE SYSTEMS ARE IDENTICAL.

M1-0001-28-1367

R
R Fuel Scavenge System Diagram
Figure 101

EFFECTIVITY: 001-224, 027



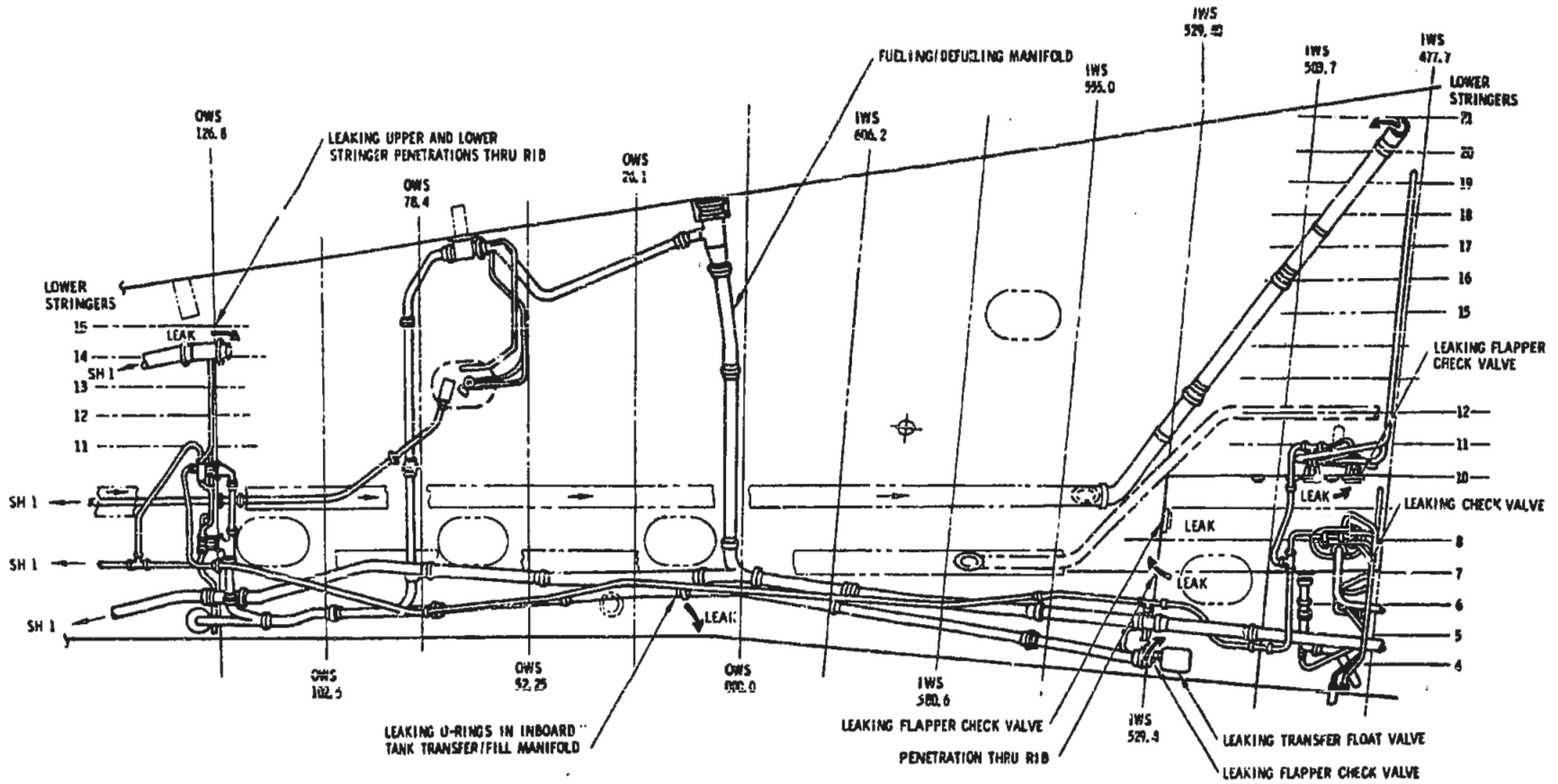
OUTBOARD TANK
LEFT WING SHOWN, RIGHT WING OPPOSITE

M1-0100-28-743

R
R Tank 2L/2R Fuel Migration Diagram
Figure 102 (Sheet 1)

EFFECTIVITY: 001-024, 027

0018



INBOARD TANK
LEFT WING SHOWN, RIGHT WING OPPOSITE

M1-0100-28-744

R
R Tank 2L/2R Fuel Migration Diagram
Figure 102 (Sheet 2)

EFFECTIVITY: 001-024, 027

0018

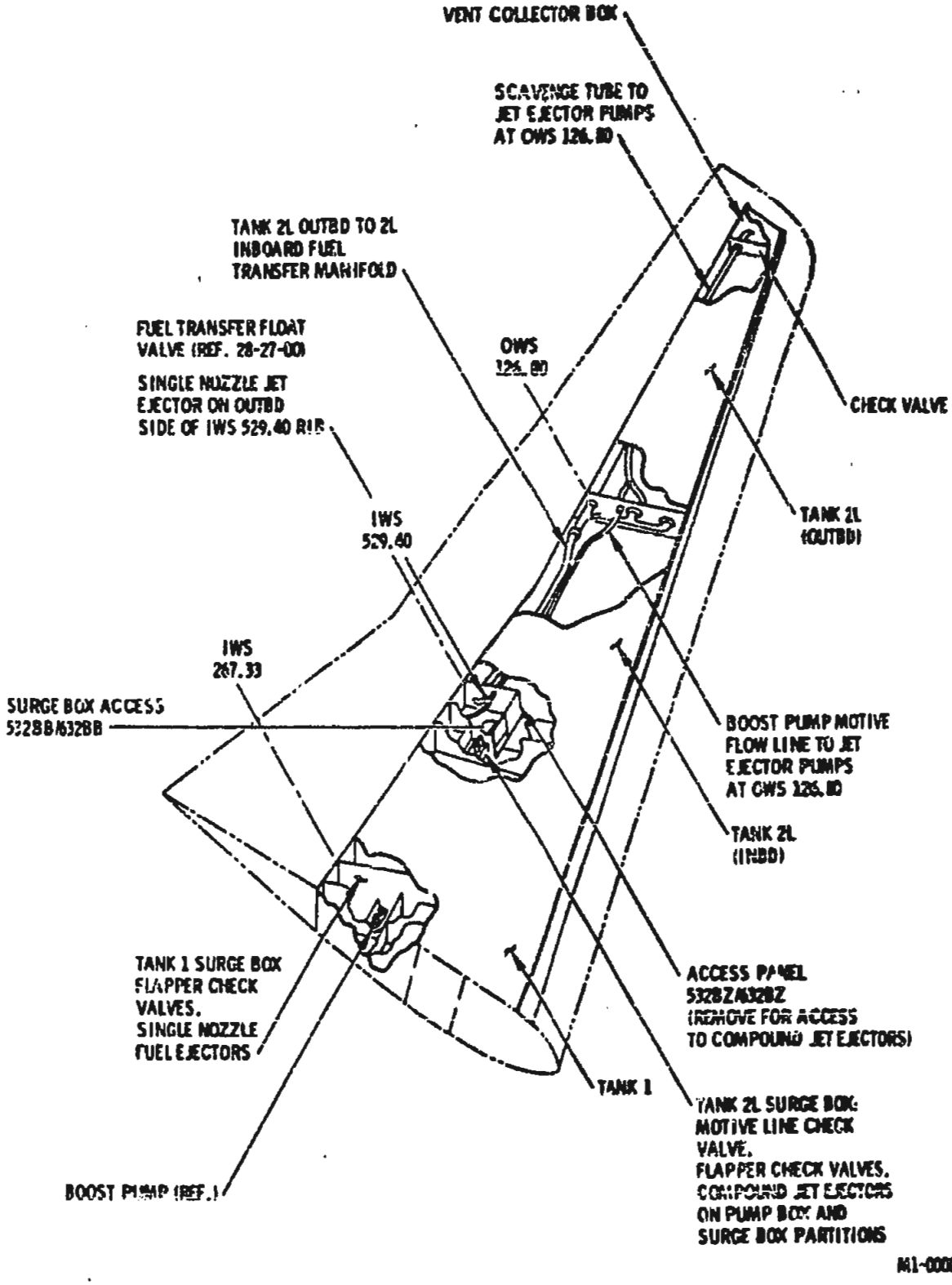
COMPONENT	QTY	AREA/ACCESS	REFERENCE
PUMP:			
COMPOUND JET EJECTOR	8	TK 2L&2R/532BB, 632BB, 533AB, 633AB, 532FB, 632FB	28-11-12
SINGLE NOZZLE JET EJECTOR (LARGE)	8	TK 2L&2R/531CB, 631CB, 532BB, 632BB	28-11-10
SINGLE NOZZLE JET EJECTOR (SMALL)	6	TK 2L&2R/531CB, 631CB, 532BB, 632BB	28-11-09
VALVE:			
VENT BOX SCAVENGE LINE CHECK	2	TK 2L&2R/534AB, 634AB, 533KB, 633KB	28-13-02
MOTIVE FLOW LINE CHECK	4	TK 2L&2R/532BB, 632BB, 533AB, 633AB	28-11-00
DUAL BOOST PUMP CHECK	8	BOOST PUMP HSG/531BB, 631BB, 532AB, 632AB	28-24-03
FLAPPER CHECK, SURGE BOX	34	TK 2L&2R/531CB, 631CB, 532BB, 632BB	28-11-01 28-11-05
FLAPPER CHECK, SURGE RIB	26	TK 1&3/541EB, 641EB	28-11-02

M1-0000-28-1488

R
R

Component Location Index
Figure 103

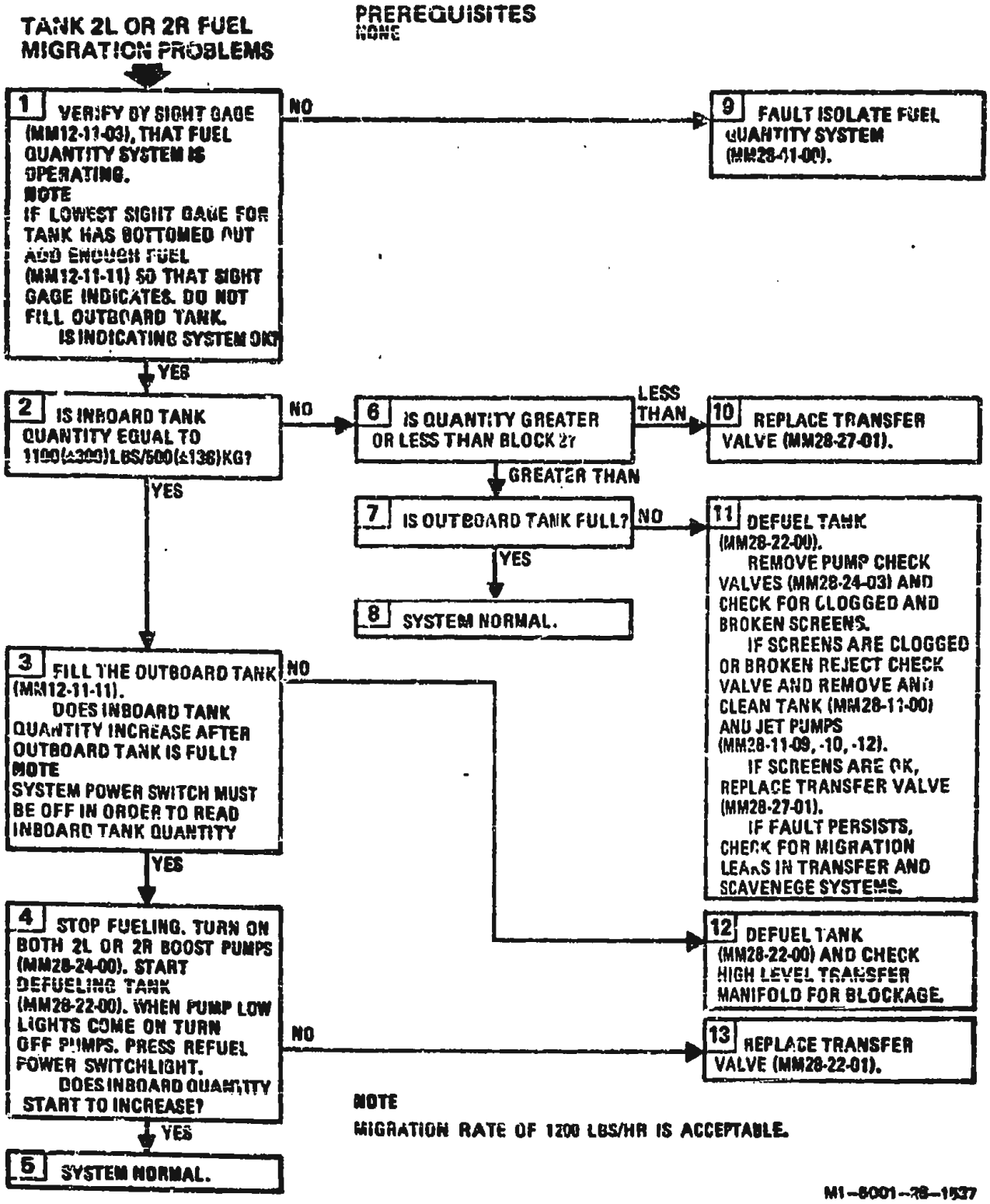
EFFECTIVITY: 001-024, 027


VENT COLLECTOR BOX
SCAVENGE TUBE TO JET EJECTOR PUMPS AT OWS 126.80
TANK 2L OUTBD TO 2L INBOARD FUEL TRANSFER MANIFOLD
FUEL TRANSFER FLOAT VALVE (REF. 28-27-00)
SINGLE NOZZLE JET EJECTOR ON OUTBD SIDE OF IWS 529.40 RIB
OWS 126.80
CHECK VALVE
IWS 529.40
TANK 2L (OUTBD)
IWS 267.33
SURGE BOX ACCESS 532BB/632BB
BOOST PUMP MOTIVE FLOW LINE TO JET EJECTOR PUMPS AT OWS 126.80
TANK 2L (INBD)
TANK 1 SURGE BOX FLAPPER CHECK VALVES. SINGLE NOZZLE FUEL EJECTORS
ACCESS PANEL 532BZ/632BZ (REMOVE FOR ACCESS TO COMPOUND JET EJECTORS)
TANK 1
TANK 2L SURGE BOX MOTIVE LINE CHECK VALVE. FLAPPER CHECK VALVES. COMPOUND JET EJECTORS ON PUMP BOX AND SURGE BOX PARTITIONS
BOOST PUMP (REF.)
M1-0000-28-1490

R
R

Component Locator
Figure 104

EFFECTIVITY: 001-024, 027


TANK 2L OR 2R FUEL MIGRATION PROBLEMS
PREREQUISITES
NONE
1 VERIFY BY SIGHT GAGE (MM12-11-03), THAT FUEL QUANTITY SYSTEM IS OPERATING.
NOTE
IF LOWEST SIGHT GAGE FOR TANK HAS BOTTOMED OUT ADD ENOUGH FUEL (MM12-11-11) SO THAT SIGHT GAGE INDICATES. DO NOT FILL OUTBOARD TANK.
IS INDICATING SYSTEM OK?
NO
9 FAULT ISOLATE FUEL QUANTITY SYSTEM (MM28-41-00).
YES
2 IS INBOARD TANK QUANTITY EQUAL TO 1100(±300)LBS/500(±136)KG?
NO
6 IS QUANTITY GREATER OR LESS THAN BLOCK 2?
LESS THAN
10 REPLACE TRANSFER VALVE (MM28-27-01).
GREATER THAN
7 IS OUTBOARD TANK FULL?
NO
11 DEFUEL TANK (MM28-22-00).
REMOVE PUMP CHECK VALVES (MM28-24-03) AND CHECK FOR CLOGGED AND BROKEN SCREENS.
IF SCREENS ARE CLOGGED OR BROKEN REJECT CHECK VALVE AND REMOVE AND CLEAN TANK (MM28-11-00) AND JET PUMPS (MM28-11-09, -10, -12).
IF SCREENS ARE OK, REPLACE TRANSFER VALVE (MM28-27-01).
IF FAULT PERSISTS, CHECK FOR MIGRATION LEAKS IN TRANSFER AND SCAVENEGE SYSTEMS.
YES
8 SYSTEM NORMAL.
YES
3 FILL THE OUTBOARD TANK (MM12-11-11).
DOES INBOARD TANK QUANTITY INCREASE AFTER OUTBOARD TANK IS FULL?
NOTE
SYSTEM POWER SWITCH MUST BE OFF IN ORDER TO READ INBOARD TANK QUANTITY
NO
12 DEFUEL TANK (MM28-22-00) AND CHECK HIGH LEVEL TRANSFER MANIFOLD FOR BLOCKAGE.
YES
4 STOP FUELING. TURN ON BOTH 2L OR 2R BOOST PUMPS (MM28-24-00). START DEFUELING TANK (MM28-22-00). WHEN PUMP LOW LIGHTS COME ON TURN OFF PUMPS. PRESS REFUEL POWER SWITCHLIGHT.
DOES INBOARD QUANTITY START TO INCREASE?
NO
13 REPLACE TRANSFER VALVE (MM28-22-01).
YES
5 SYSTEM NORMAL.
NOTE
MIGRATION RATE OF 1200 LBS/HR IS ACCEPTABLE.
M1-8001-28-1537

CR Tank 2L/2R Fuel Migration Problems
CR Figure 105

EFFECTIVITY: 001-024, 027

TANKS - FAULT ISOLATION

1. General

Reference data and fault isolation procedures for troubleshooting APU powerplant system faults are included in this section of the manual. A tank fuel distribution/scavenge system problem detected by the flight crew is normally entered in the aircraft flight log book and reported to maintenance personnel by a FIRM fault code number. This number and the flight log book write-up can be found in the Chapter 28 Fault Code Index. The index specifies the maintenance manual section, fault isolation diagram figure number and, where appropriate, a block number indicating the diagram entry point containing the fault isolation procedure. When no block number is specified, the diagram entry point is block 1.

Prerequisites listed at the top of each diagram identify mandatory preliminary steps and circuit breakers that must be closed before initiating any fault isolation step.

Schematic diagrams, identified by a SCHEM number, supplement fault isolation procedures as maintenance aids. The schematics show the basic system circuitry necessary for troubleshooting and include cross-reference indexes to the wiring diagram manual pages required for checking component interconnect wiring.

2. Supplemental Data

Supplementary data includes functional tests, checkout tests, BITE checks and other general information that can be helpful in performing fault isolation. Supplementary data in this section is listed in Table 101.

Supplemental Data
Table 101

TABLE/FIGURE NO.	TITLE
Fig. 101	Tank 2L/2R Fuel Scavenge System Diagram
Fig. 102	Tank 2L/2R Fuel Migration Diagram

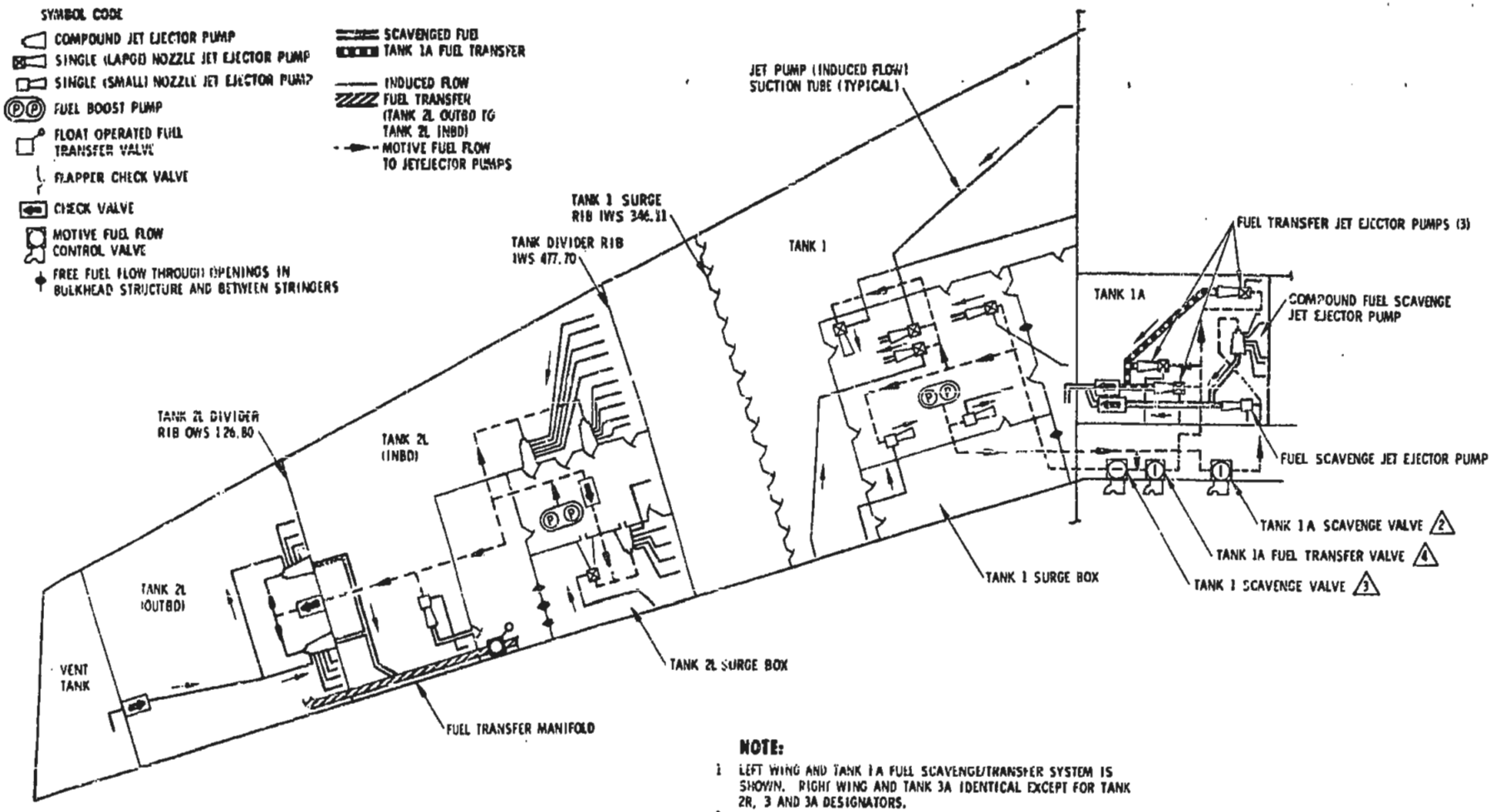
3. Fault Isolation

Table 102 is a list of fault isolation data in this section of the manual.

R For fuel migration from tank 1 or 3 to the companion tank 1A or
R 3A, refer to Fig. 105. For fuel migration from outboard to
R inboard section of tank 2L or 2R, refer to Fig. 106. For all
R other fuel migration faults, refer to appropriate 28-24-00,101
R diagram.

Fault Isolation Data
Table 102

FIGURE	TITLE
103	Component Location Index
104	Component Locator
105	Tank 1A or 3A Scavenge System Checkout
106	Tank 2L/2R Fuel Migration Problems
SCHEM 1	Tank 1A and 3A Scavenge System Schematic


SYMBOL CODE
COMPOUND JET EJECTOR PUMP
SINGLE (LARGE) NOZZLE JET EJECTOR PUMP
SINGLE (SMALL) NOZZLE JET EJECTOR PUMP
FUEL BOOST PUMP
FLOAT OPERATED FUEL TRANSFER VALVE
FLAPPER CHECK VALVE
CHECK VALVE
MOTIVE FUEL FLOW CONTROL VALVE
FREE FUEL FLOW THROUGH OPENINGS IN BULKHEAD STRUCTURE AND BETWEEN STRINGERS
SCAVENGED FUEL
TANK 1A FUEL TRANSFER
INDUCED FLOW
FUEL TRANSFER (TANK 2L OUTBD TO TANK 2L INBD)
MOTIVE FUEL FLOW TO JETEJECTOR PUMPS
JET PUMP (INDUCED FLOW) SUCTION TUBE (TYPICAL)
TANK 1 SURGE RIB IWS 346.11
TANK DIVIDER RIB IWS 477.70
TANK 1
TANK 1A
FUEL TRANSFER JET EJECTOR PUMPS (3)
COMPOUND FUEL SCAVENGE JET EJECTOR PUMP
FUEL SCAVENGE JET EJECTOR PUMP
TANK 2L DIVIDER RIB OWS 126.80
TANK 2L (INBD)
TANK 2L (OUTBD)
VENT TANK
TANK 1 SURGE BOX
TANK 2L SURGE BOX
FUEL TRANSFER MANIFOLD
TANK 1A SCAVENGE VALVE 2
TANK 1A FUEL TRANSFER VALVE 4
TANK 1 SCAVENGE VALVE 3

NOTE:

1 LEFT WING AND TANK 1A FUEL SCAVENGE/TRANSFER SYSTEM IS SHOWN. RIGHT WING AND TANK 3A IDENTICAL EXCEPT FOR TANK 2R, 3 AND 3A DESIGNATORS.

2 NORMALLY CLOSED, OPEN WHEN AIRCRAFT IS AIRBORNE.

3 NORMALLY OPEN; CLOSES WHEN 1A FUEL TRANSFER VALVE IS OPENED.

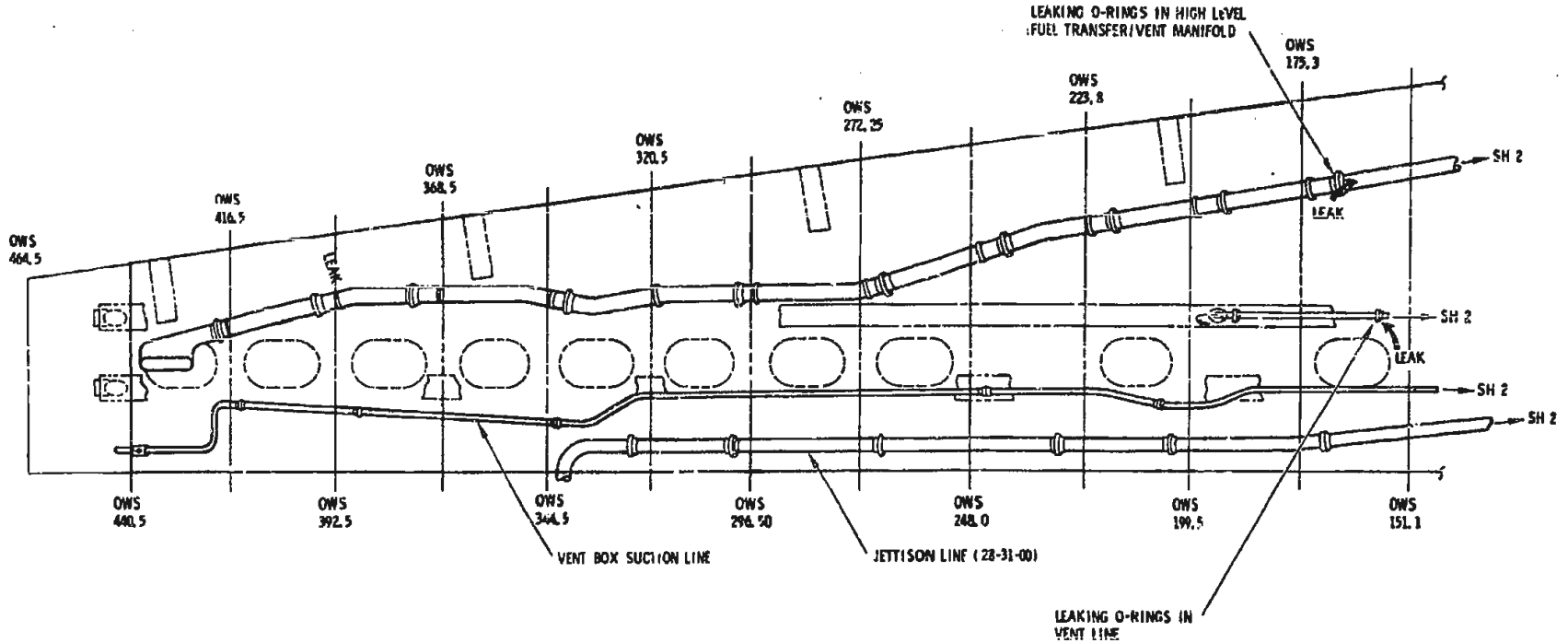
4 NORMALLY CLOSED, OPENS WHEN FUEL TRANSFER IS SELECTED. WHEN OPENED IN-FLIGHT, FUEL TRANSFER FLOW RATE IS COMBINED FLOW INDUCED BY BOTH FUEL TRANSFER AND FUEL SCAVENGE JET EJECTOR PUMPS.

A11-0001-28-1359

Fuel Scavenge System Diagram
Figure 101

R R EFFECTIVITY: 025-026, 028-999

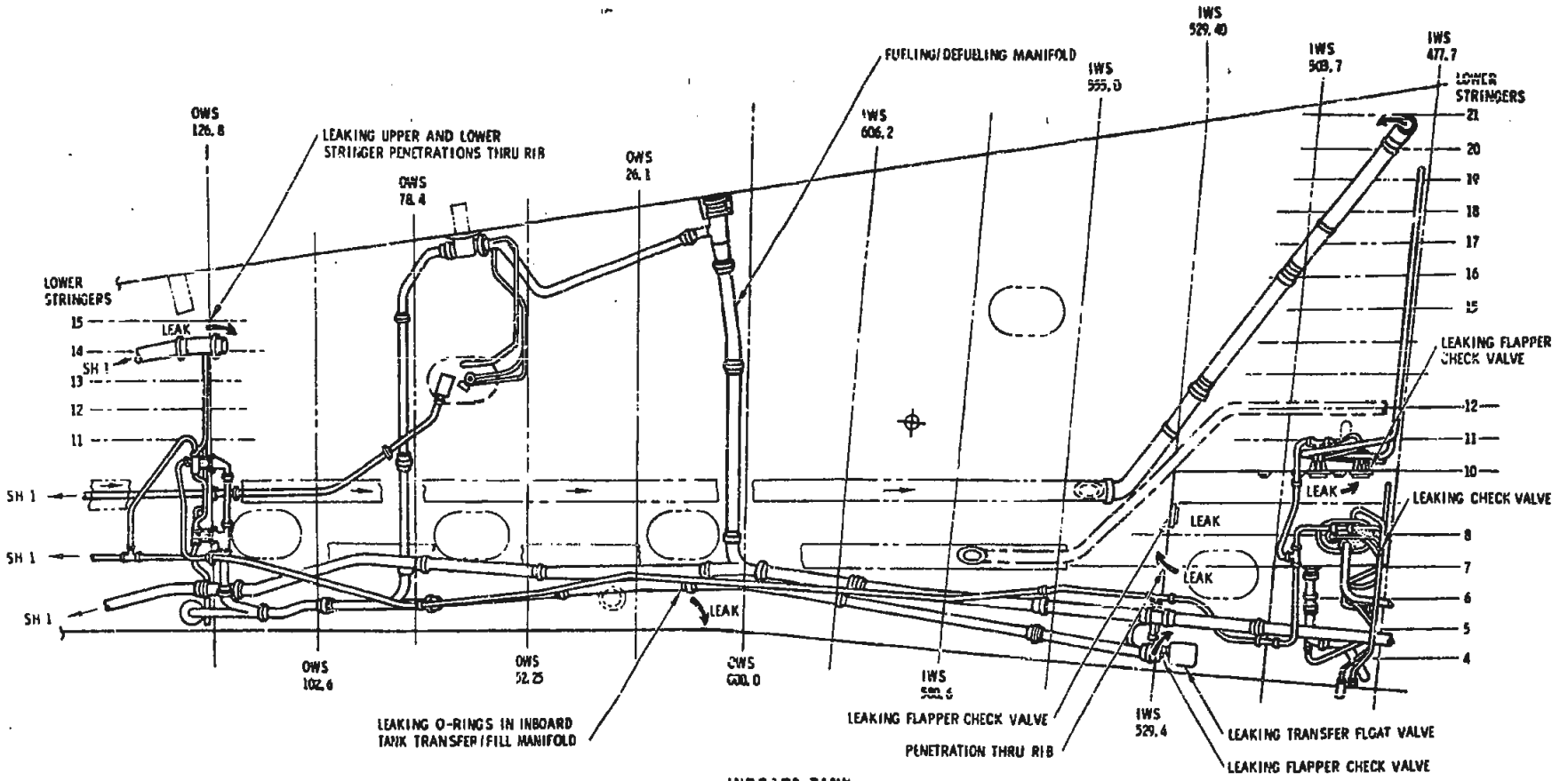
0028



OUTBOARD TANK
LEFT WING SHOWN, RIGHT WING OPPOSITE

M1-0100-28-743

Tank 2L/2R Fuel Migration Diagram
Figure 102 (Sheet 1)



INBOARD TANK
LEFT WING SHOWN, RIGHT WING OPPOSITE

M1-0100-28-744

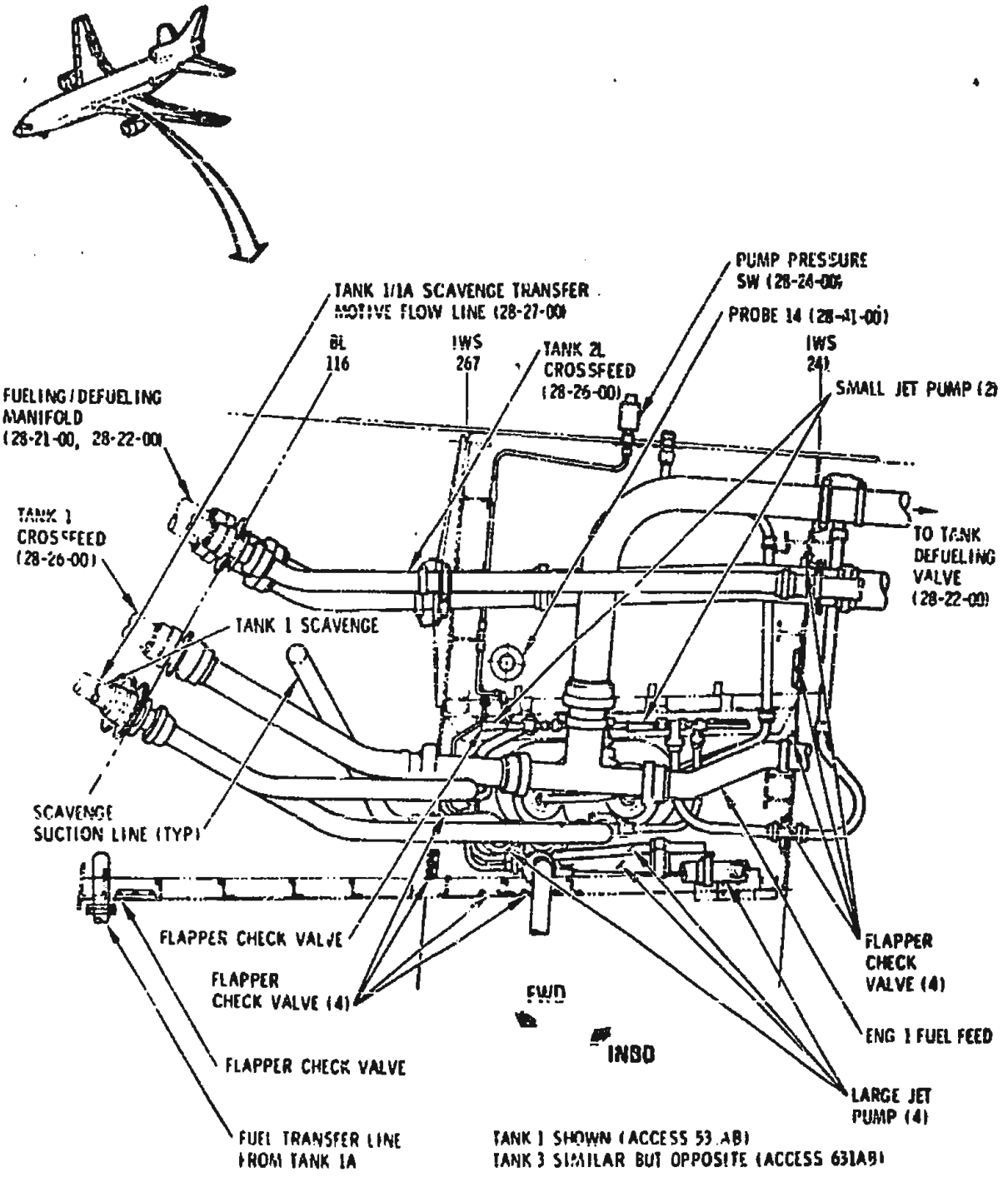
Tank 2L/2R Fuel Migration Diagram
Figure 102 (Sheet 2)

R EFFECTIVITY: 025-026, 028-999
R
0028

COMPONENT	QTY	AREA/ACCESS	REFERENCE
ACTUATOR:			
TANK 1&3 SCAVENGE VALVE	2	CTR SECT AFT BAY/147AZ	28-11-08
TANK 1A&3A SCAVENGE VALVE	2	CTR SECT AFT BAY/147AZ	28-11-14
PUMP:			
COMPOUND JET EJECTOR	10	TK2L&2R, 1A&3A/532BB, 632BB, 533AB, 633AB, 532FB, 632FB, 147AZ OR 141AZ, 141.3AZ OR 141.7AZ, 141.4AZ OR 141.8AZ	28-11-12 28-11-13
SINGLE NOZZLE JET EJECTOR (LARGE)	12	TK2L&2R, 1A&3A/531CB, 631CB, 532BB, 147AZ OR 141AZ, 141.3AZ OR 141.7AZ, 141.4AZ OR 141.8AZ	28-11-10
SINGLE NOZZLE JET EJECTOR (SMALL)	10	TK2L&2R, 1A&3A/531CB, 631CB, 532BB, 147AZ OR 141AZ, 141.3AZ OR 141.7AZ, 141.4AZ OR 141.8AZ	28-11-09 28-11-11
VALVE:			
VENT BOX SCAVENGE LINE CHECK	2	TK2L&2R 534AB, 634AB, 533KB, 633KB	28-13-02
MOTIVE FLOW LINE CHECK	4	TK2L&2R 532BB, 632BB, 533AB, 633AB	28-11-00
DUAL BOOST PUMP CHECK	8	BOOST PUMP HSG 531BB, 631BB, 532AB, 632AB	28-11-02
FLAPPER CHECK, SURGE BOX	34	TK2L&2R 531KB, 631CB, 532BB, 633CB	28-11-01 28-11-05
FLAPPER CHECK, SURGE RIB	26	TK1&3 541EB, 641EB	28-11-02
TANK 1&3 SCAVENGE	2	RT&LT MLG WHEEL WELL	28-11-08
TANK 1A&3A SCAVENGE	2	RT&LT MLG WHEEL WELL	28-11-14

M1 0000 28 1491

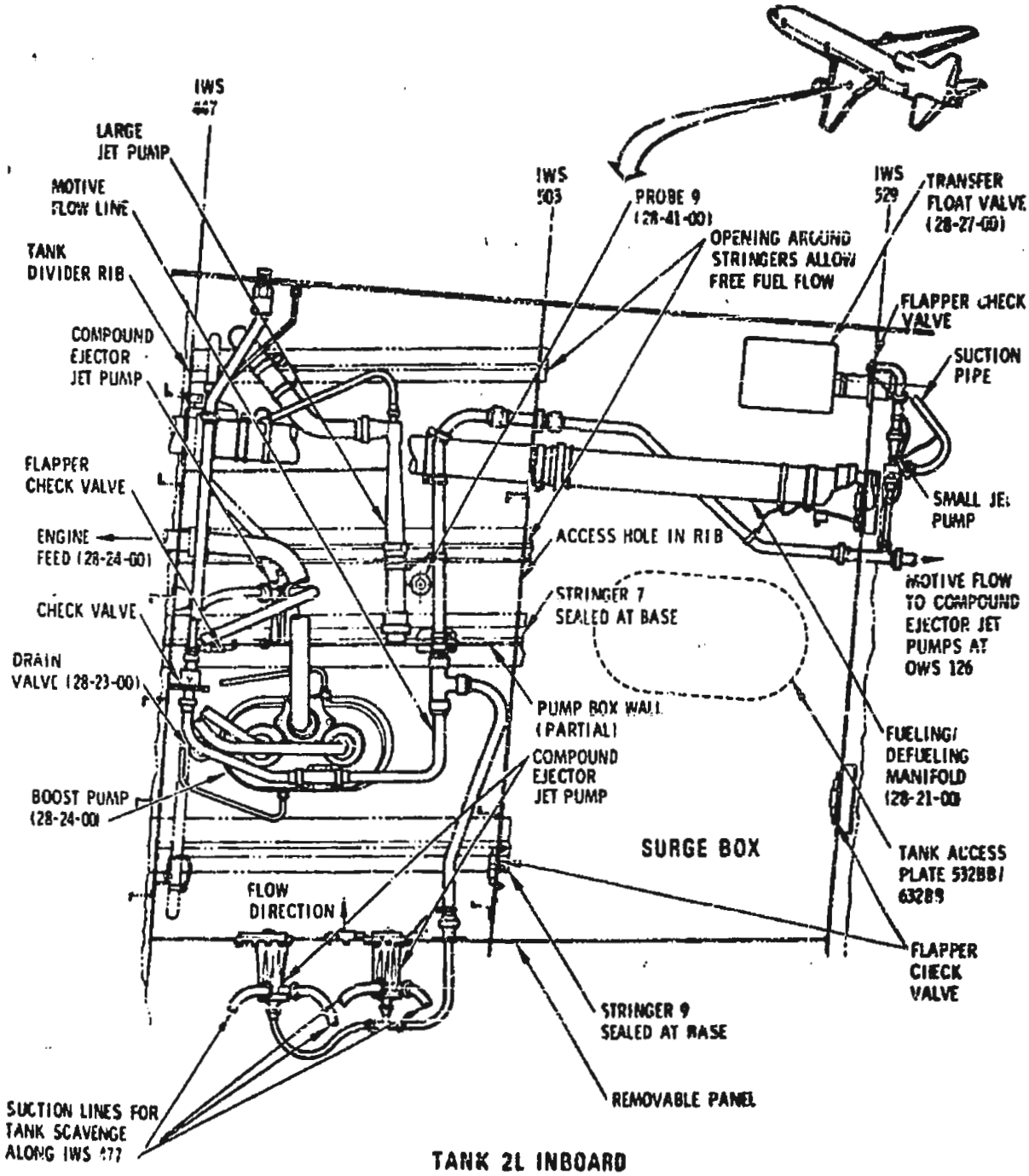
Component Location Index
Figure 103



TANK 1

M1-60501-28-1170

Components Locator
Figure 104 (Sheet 1)



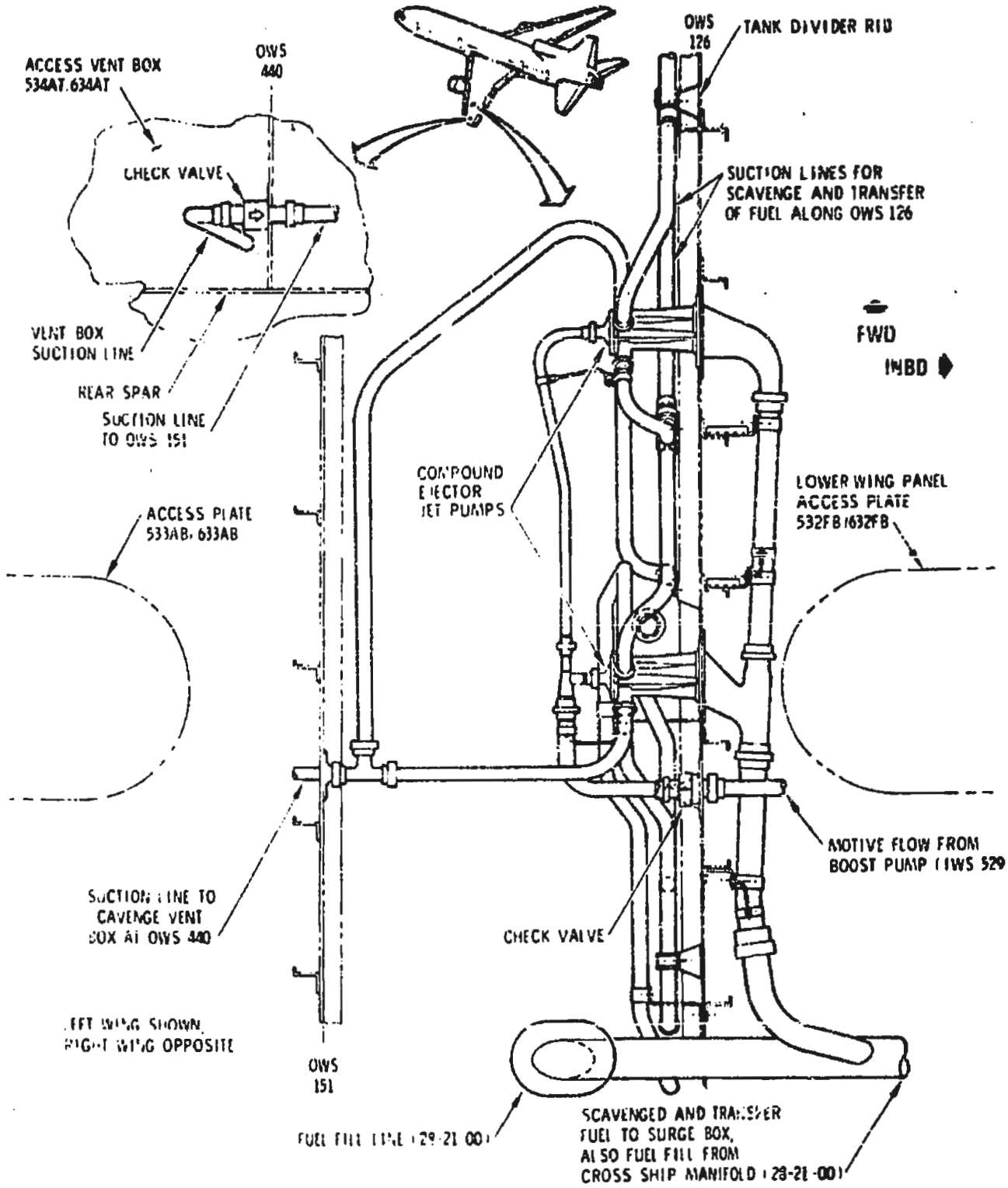
TANK 2L INBOARD

M1-0100-28-747

Components Locator
Figure 104 (Sheet 2)

R EFFECTIVITY: 025-026, 028-999
R

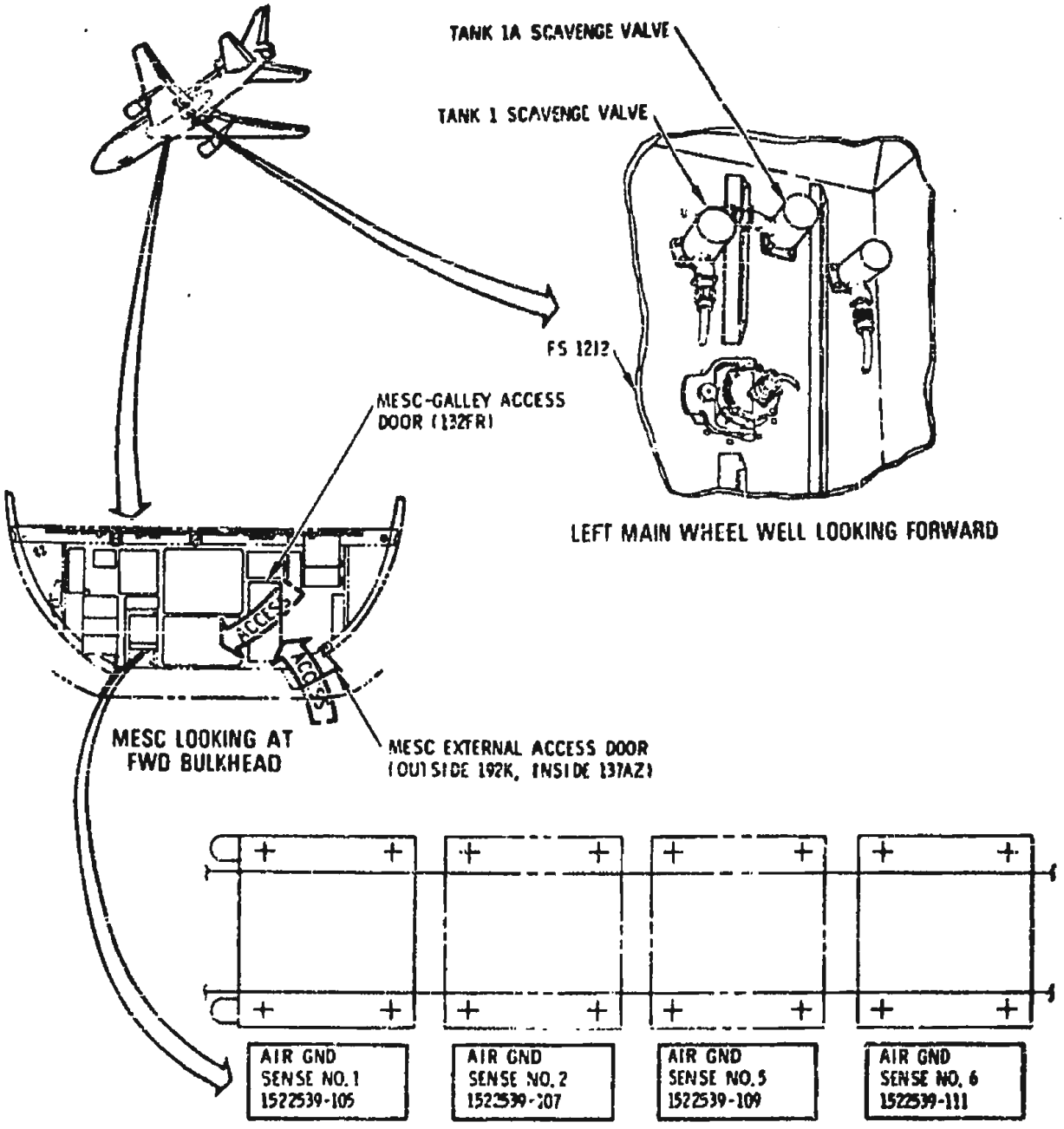
0028



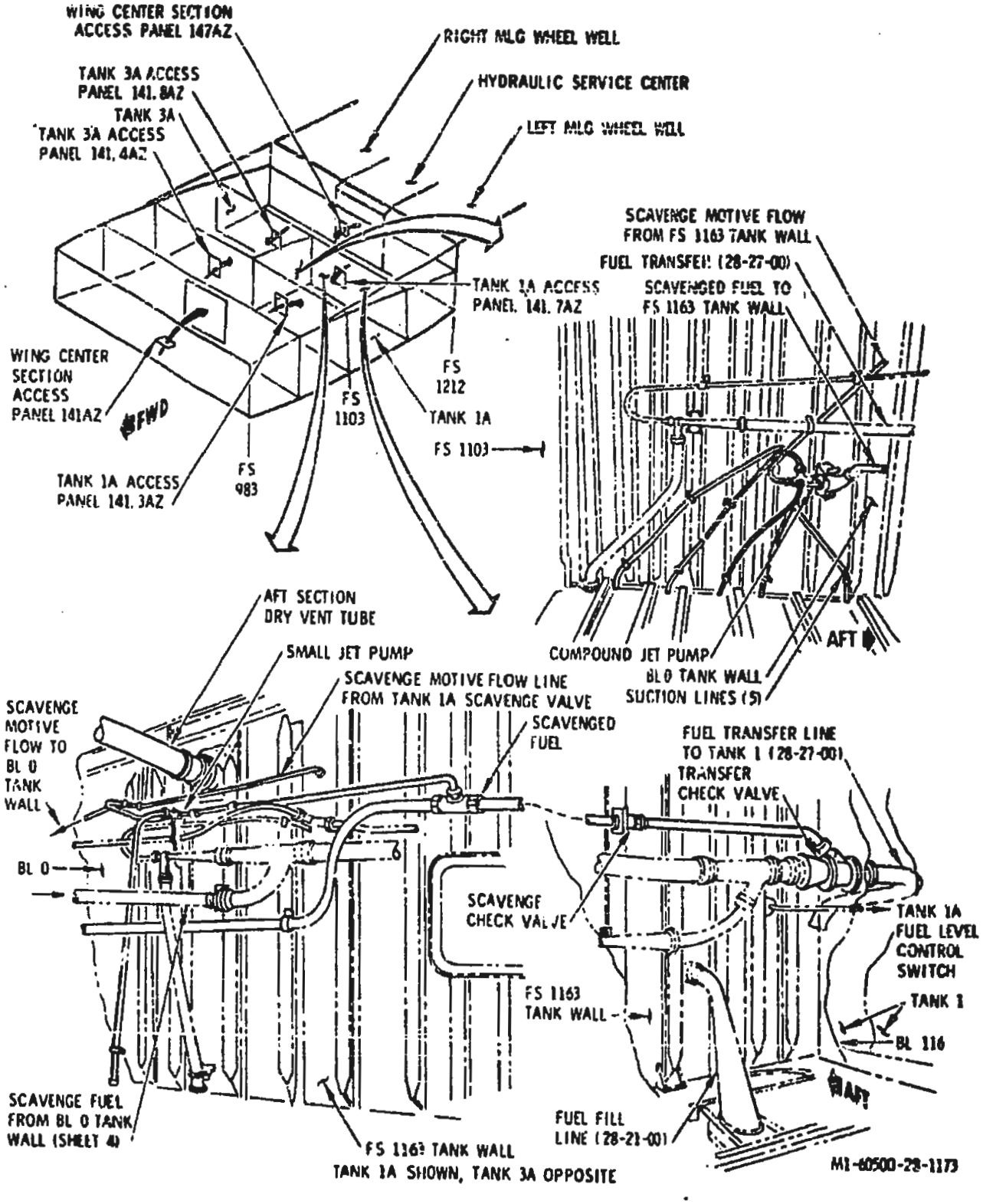
TANK 2L OUTBOARD COMPARTMENT

M1-0100-28-748

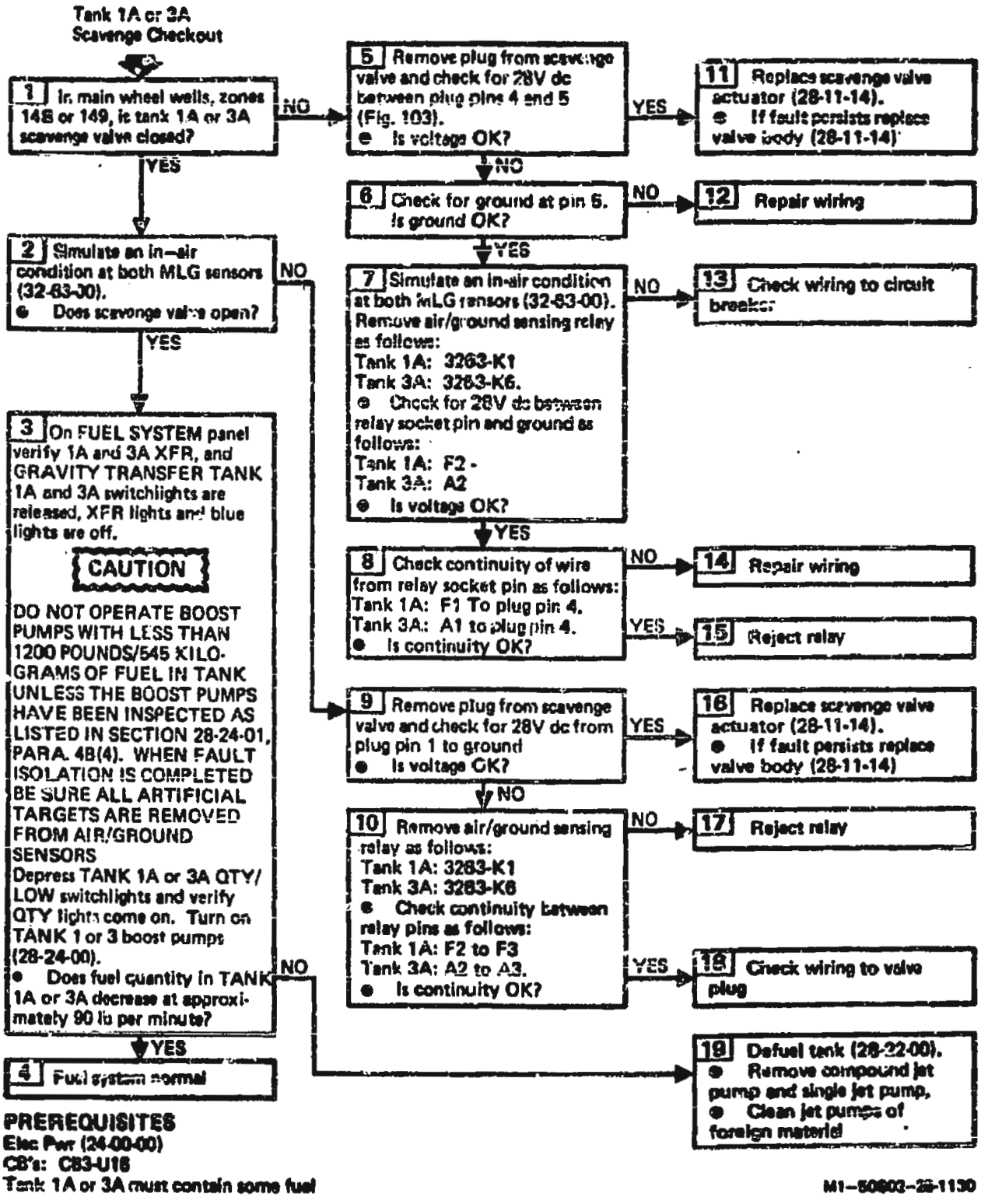
Components Locator
Figure 104 (Sheet 3)


TANK 1A SCAVENGE VALVE
TANK 1 SCAVENGE VALVE
FS 1212
MESC-GALLEY ACCESS DOOR (132FR)
LEFT MAIN WHEEL WELL LOOKING FORWARD
MESC LOOKING AT FWD BULKHEAD
MESC EXTERNAL ACCESS DOOR (OUTSIDE 192K, INSIDE 137AZ)
AIR GND SENSE NO. 1 1522539-105
AIR GND SENSE NO. 2 1522539-107
AIR GND SENSE NO. 5 1522539-109
AIR GND SENSE NO. 6 1522539-111
M1-39200-28-1172

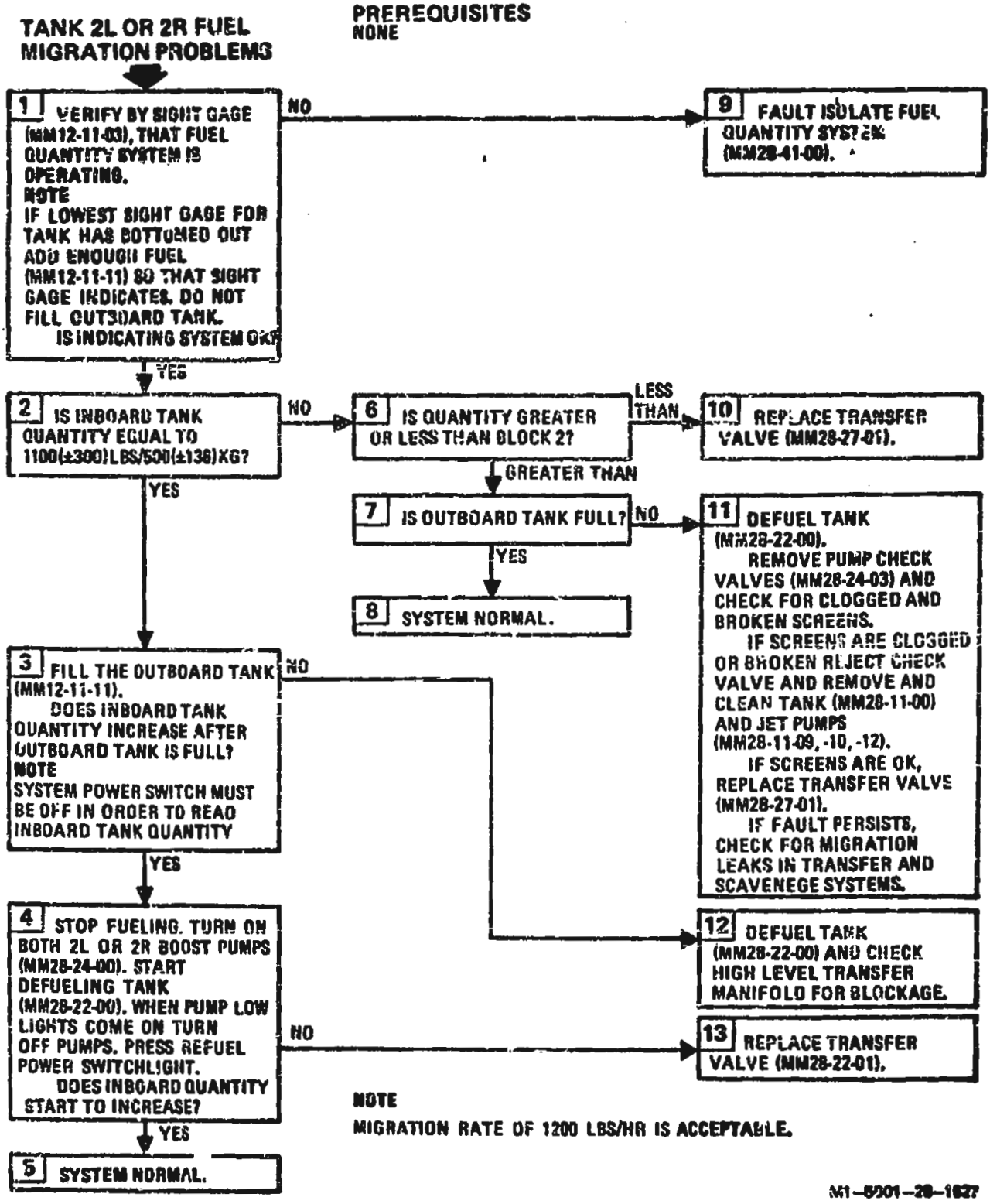
Components Locator
Figure 104 (Sheet 4)


WING CENTER SECTION ACCESS PANEL 147AZ
RIGHT MLG WHEEL WELL
TANK 3A ACCESS PANEL 141.8AZ
HYDRAULIC SERVICE CENTER
TANK 3A
TANK 3A ACCESS PANEL 141.4AZ
LEFT MLG WHEEL WELL
SCAVENGE MOTIVE FLOW FROM FS 1163 TANK WALL
FUEL TRANSFER (28-27-00)
TANK 1A ACCESS PANEL 141.7AZ
SCAVENGED FUEL TO FS 1163 TANK WALL
WING CENTER SECTION ACCESS PANEL 141AZ
FWD
FS 1212
FS 1103
TANK 1A
FS 1103
TANK 1A ACCESS PANEL 141.3AZ
FS 983
AFT SECTION DRY VENT TUBE
SMALL JET PUMP
SCAVENGE MOTIVE FLOW LINE FROM TANK 1A SCAVENGE VALVE
COMPOUND JET PUMP
BL 0 TANK WALL SUCTION LINES (5)
AFT
SCAVENGE MOTIVE FLOW TO BL 0 TANK WALL
SCAVENGED FUEL
FUEL TRANSFER LINE TO TANK 1 (28-27-00)
TRANSFER CHECK VALVE
BL 0
SCAVENGE CHECK VALVE
TANK 1A FUEL LEVEL CONTROL SWITCH
FS 1163 TANK WALL
TANK 1
BL 116
AFT
SCAVENGE FUEL FROM BL 0 TANK WALL (SHEET 4)
FUEL FILL LINE (28-21-00)
FS 1163 TANK WALL
TANK 1A SHOWN, TANK 3A OPPOSITE
M1-60500-28-1173

Tank Components Locator
Figure 104 (Sheet 5)

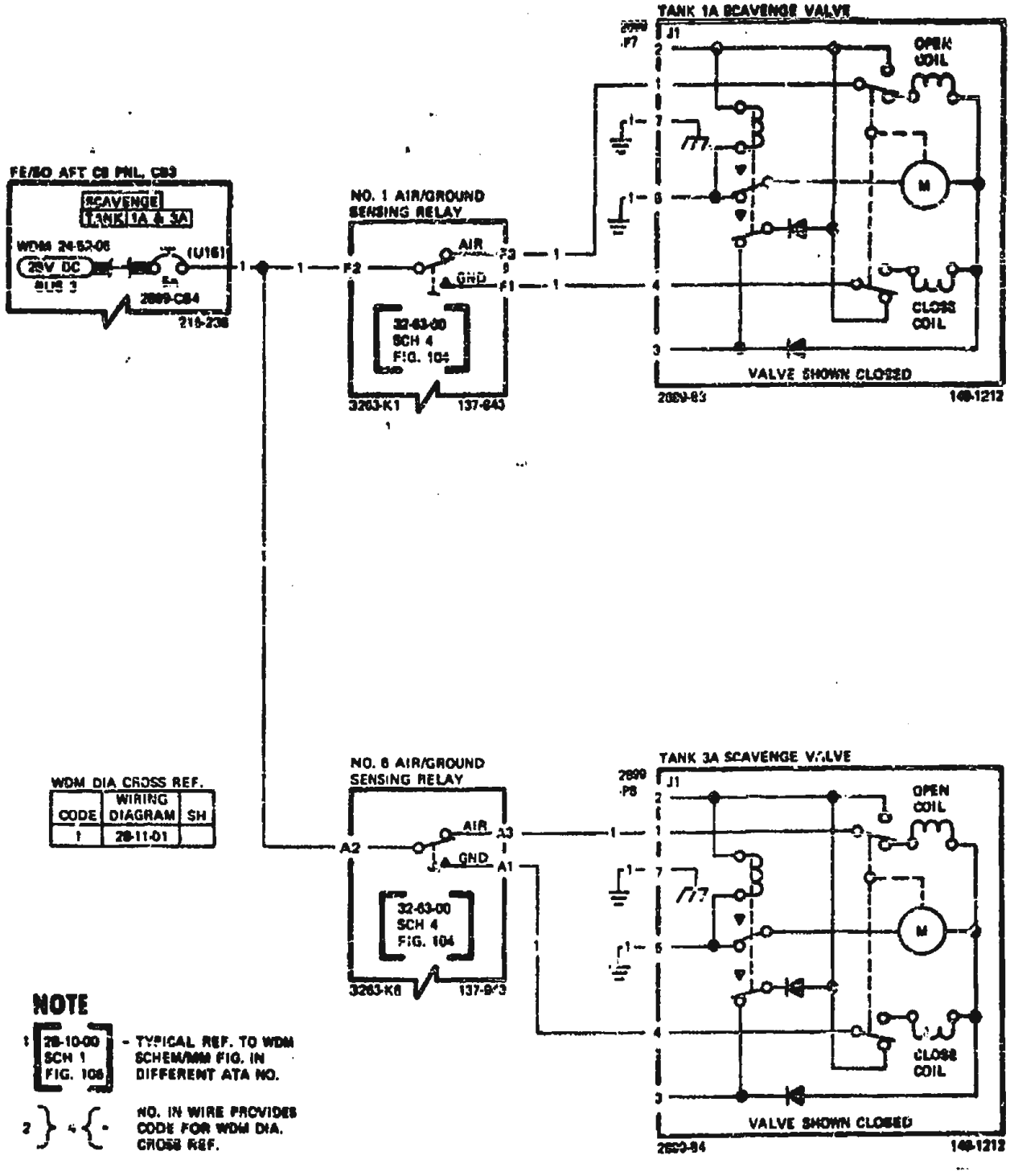

Tank 1A or 3A Scavenge Checkout
1 In main wheel wells, zones 148 or 149, is tank 1A or 3A scavenge valve closed?
NO
YES
2 Simulate an in-air condition at both MLG sensors (32-83-00).
• Does scavenge valve open?
NO
YES
3 On FUEL SYSTEM panel verify 1A and 3A XFR, and GRAVITY TRANSFER TANK 1A and 3A switchlights are released, XFR lights and blue lights are off.
CAUTION
DO NOT OPERATE BOOST PUMPS WITH LESS THAN 1200 POUNDS/545 KILOGRAMS OF FUEL IN TANK UNLESS THE BOOST PUMPS HAVE BEEN INSPECTED AS LISTED IN SECTION 28-24-01, PARA. 4B(4). WHEN FAULT ISOLATION IS COMPLETED BE SURE ALL ARTIFICIAL TARGETS ARE REMOVED FROM AIR/GROUND SENSORS
Depress TANK 1A or 3A QTY/LOW switchlights and verify QTY lights come on. Turn on TANK 1 or 3 boost pumps (28-24-00).
• Does fuel quantity in TANK 1A or 3A decrease at approximately 90 lb per minute?
NO
YES
4 Fuel system normal
5 Remove plug from scavenge valve and check for 28V dc between plug pins 4 and 5 (Fig. 103).
• Is voltage OK?
YES
NO
11 Replace scavenge valve actuator (28-11-14).
• If fault persists replace valve body (28-11-14)
6 Check for ground at pin 5. Is ground OK?
NO
YES
12 Repair wiring
7 Simulate an in-air condition at both MLG sensors (32-83-00). Remove air/ground sensing relay as follows:
Tank 1A: 3283-K1
Tank 3A: 3283-K6.
• Check for 28V dc between relay socket pin and ground as follows:
Tank 1A: F2 -
Tank 3A: A2
• Is voltage OK?
NO
YES
13 Check wiring to circuit breaker
8 Check continuity of wire from relay socket pin as follows:
Tank 1A: F1 To plug pin 4.
Tank 3A: A1 to plug pin 4.
• Is continuity OK?
NO
YES
14 Repair wiring
15 Reject relay
9 Remove plug from scavenge valve and check for 28V dc from plug pin 1 to ground
• Is voltage OK?
YES
NO
16 Replace scavenge valve actuator (28-11-14).
• If fault persists replace valve body (28-11-14)
10 Remove air/ground sensing relay as follows:
Tank 1A: 3283-K1
Tank 3A: 3283-K6
• Check continuity between relay pins as follows:
Tank 1A: F2 to F3
Tank 3A: A2 to A3.
• Is continuity OK?
NO
YES
17 Reject relay
18 Check wiring to valve plug
19 Defuel tank (28-22-00).
• Remove compound jet pump and single jet pump.
• Clean jet pumps of foreign material
PREREQUISITES
Elec Pwr (24-00-00)
CB's: C83-U16
Tank 1A or 3A must contain some fuel
M1-50803-28-1130

Tank 1A or 3A Scavenge Checkout
Figure 105


TANK 2L OR 2R FUEL MIGRATION PROBLEMS
PREREQUISITES
NONE
1 VERIFY BY SIGHT GAGE (MM12-11-03), THAT FUEL QUANTITY SYSTEM IS OPERATING.
NOTE
IF LOWEST SIGHT GAGE FOR TANK HAS BOTTOMED OUT ADD ENOUGH FUEL (MM12-11-11) SO THAT SIGHT GAGE INDICATES. DO NOT FILL OUTBOARD TANK.
IS INDICATING SYSTEM OK?
NO
9 FAULT ISOLATE FUEL QUANTITY SYSTEM (MM28-41-00).
YES
2 IS INBOARD TANK QUANTITY EQUAL TO 1100(±300)LBS/500(±136)KG?
NO
6 IS QUANTITY GREATER OR LESS THAN BLOCK 2?
LESS THAN
10 REPLACE TRANSFER VALVE (MM28-27-01).
GREATER THAN
YES
7 IS OUTBOARD TANK FULL?
NO
11 DEFUEL TANK (MM28-22-00).
REMOVE PUMP CHECK VALVES (MM28-24-03) AND CHECK FOR CLOGGED AND BROKEN SCREENS.
IF SCREENS ARE CLOGGED OR BROKEN REJECT CHECK VALVE AND REMOVE AND CLEAN TANK (MM28-11-00) AND JET PUMPS (MM28-11-09, -10, -12).
IF SCREENS ARE OK, REPLACE TRANSFER VALVE (MM28-27-01).
IF FAULT PERSISTS, CHECK FOR MIGRATION LEAKS IN TRANSFER AND SCAVENEGE SYSTEMS.
YES
8 SYSTEM NORMAL.
3 FILL THE OUTBOARD TANK (MM12-11-11).
DOES INBOARD TANK QUANTITY INCREASE AFTER OUTBOARD TANK IS FULL?
NOTE
SYSTEM POWER SWITCH MUST BE OFF IN ORDER TO READ INBOARD TANK QUANTITY
NO
YES
12 DEFUEL TANK (MM28-22-00) AND CHECK HIGH LEVEL TRANSFER MANIFOLD FOR BLOCKAGE.
4 STOP FUELING. TURN ON BOTH 2L OR 2R BOOST PUMPS (MM28-24-00). START DEFUELING TANK (MM28-22-00). WHEN PUMP LOW LIGHTS COME ON TURN OFF PUMPS. PRESS REFUEL POWER SWITCHLIGHT.
DOES INBOARD QUANTITY START TO INCREASE?
NO
13 REPLACE TRANSFER VALVE (MM28-22-01).
YES
5 SYSTEM NORMAL.
NOTE
MIGRATION RATE OF 1200 LBS/HR IS ACCEPTABLE.
M1-5201-28-1827

CR Tank 2L/2R Fuel Migration Problems
CR Figure 106

EFFECTIVITY: 025-026, 028-999



EM1-38701-38-1044

R
R
Tank 1A and 3A Scavenge System Schematic
SCHEM 1

EFFECTIVITY: 025-026, 028-999

TANKS - MAINTENANCE PRACTICES

1. Fuel Tanks

A. Tank 2L/2R Fuel Scavenge System Deactivation Procedure.

The following procedure specifies tasks that must be done if the aircraft is dispatched with an inoperative tank 2L and/or 2R fuel scavenge system.

NOTE: This deactivation procedure applies only when an aircraft is to be dispatched in accordance with the MEL.

R (1) On a daily basis, drain all condensate from tank.

R R (2) Install appropriate placard at FE/SO panel. Placard must state which tank has inoperative fuel scavenge system.

(3) Make appropriate entry in aircraft log book.

2. Tank Maintenance

The following instructions contain procedures for performing maintenance and repair work in fuel tanks areas, and microbial treatment of tanks. Included are safety precautions and procedures for fuel tank purging and application of fuel tank sealants.

3. Equipment and Materials

Cap, Cotton

Coveralls, William M. Fredericks Co. J129, or equivalent

Boot Sock, William M. Fredericks Co. No. 220 BSX, or equivalent

Vinyl Foot Cover, William M. Fredericks Co. No. 495, or equivalent

Head Covering, William M. Fredericks Co. No. 14C, or equivalent

Airline Respirator, Bureau of Mines approved, Mines Safety Appliance Co., or equivalent

Vinyl Gloves, William M. Fredericks Co. No. 110, or equivalent

Rubber Gloves

Portable Hand Lights, Explosion Proof (Class 1, Group D)

Sealant Gun, LAC 290B6-2 (Semco Research Co. Model 250), or equivalent

Sealant Gun Cartridge and Plunger, LAC 290B-6 (Semco Research Co. Model 250C), or equivalent

Nozzle Tips, Lockheed-Pyles Sealant Tips, various sizes, as required (Semco Research Co.), or equivalent

Comb, Sealant Spreader, L295X77-1, or equivalent

Fuel Tank Work Pads, L295X85 (in various sizes, as required), or equivalent

Rags, White, Grease and Soap Free, DDD-R-30, Class 1, Grade A

Chemical Goggles, Wilson X41, or equivalent

Brushes, Natural Bristle (in sizes to suit requirements)

Glue Brushes, Sinclair P-28, or equivalent

Solvent Safety Cans

Spatulas, plastic and wooden (locally fabricated to suit requirements)

Spatulas, metallic, sealant spreader

Scraper, Plexiglas (locally fabricate to suit requirements)

Combustible Gas Indicator, Mine Safety Appliance Co. Model 40, or equivalent

Toxic Detector, Enmet Model CGS-8ML, or equivalent.

Fire Extinguisher, 50 lb. CO_2

Semkit Mixer, Semco Research Co. Model 285, or equivalent

Heater-blower Exhauster, American Air Filter Co. Model H-40, or equivalent

Vacuum Cleaner, Air-operated

Venturi Type Air Mover, Size 6, Corpus Engineering Co., or equivalent

Sealing Compounds:

Fillet Material, 2 hr. application life, LCM 40-2180 Type I, or equivalent (Products Research Co. PR 1422 B-2 is an approved equivalent)

Fillet Material, 1/2 hr. application life, LCM 40-1218 Type I, or equivalent (Products Research Co. PR 1422 B-1/2, 3M Co. EC 1239-B2, Coast Pro-Seal and Mfg Co. 707-B2 are approved equivalents)

Brush Material, 2 hr. application life, LCM 40-2180 Type II, or equivalent (Products Research Co. PR-1422A-2(W) is an approved equivalent)

Brush Material, 1/2 hr. application life, LCM 40-1218 Type II, or equivalent (Products Research Co. PR-6101, 3M Co. EC 1239-A2, Coast Pro-Seal and Mfg. Co. 707-A2 are approved equivalents)

Faying Surface Material, 20 hr. application life, LCM 40-2121 Type II, Class B12, or equivalent (Products Research Co. PR-1431-GT, Type I is an approved equivalent)

Faying Surface Material, 80 hr. application life, LCM 40-2121 Type II, Class B24, or equivalent (Products Research Co. PR-1431-GT, Type II is an approved equivalent)

Quick Repair, Low Temperature Cure, 1/4 hr. application life, Products Research Co. PR-1435, or equivalent

Chlorinated Cleaner, LAC 32-337, or equivalent (Turco Products Co. No. 657, Penwatt Corp. No. 2083, Leeder Chemicals Co. No. 885, West Chemical Products No. 1484, Cee Bee Chemical C-50 are approved equivalents)

Petroleum Base Cleaner, LCM 32-1087, or equivalent (Leeder Chemical Co. 101KE, Kelite Products Co. KUL, Pennsalt Chemical Co. No. 4091 are approved equivalents)

Methyl-Ethyl-Ketone (MEK), Fed. Spec. TT-M-261

Solvent Dispensers (Polyethelene Bottles)

Biocide Fuel Additive, BIOBOR JF

Fuel, Approved Aviation (Ref. 12-11-02)

4. Referenced Procedures

	12-11-02	Fuel System - Servicing
R R	20-28-03	Application of Fuel Vapor Barrier Coating and Wing-Pylon Interface Sealing
	24-41-00	External Power/Ground Service System - Maintenance Practices
	28-22-00	Defueling - Maintenance Practices
	28-23-00	Draining - Description and Operation
	57-33-01	Cover Plates and Access Doors - Removal and Installation

5. Aircraft Fuels

A. General

Entry of aircraft fuel tanks by maintenance personnel is required when non-routine and scheduled maintenance checks, inspections, modifications, or component replacement is necessary. The potential dangers involved when entering and working in areas that have contained aircraft fuels cannot be overemphasized. It is, therefore, imperative that personnel assigned these tasks strictly adhere to the standard practices and maintenance procedures established to assure safety of personnel, equipment, and the aircraft.

B. Fuel Types and Characteristics

Turbine-powered aircraft can be operated using several approved type fuels. The type of fuel used has a direct bearing on the potential hazards and the degree of safety precautions necessary when entering fuel tanks. A list of fuels approved for L-1011 aircraft is included in section 12-11-02 Fuel System - Servicing. These fuels are generally referred to as one of the following types.

JET Type JET A fuel is essentially a blend of kerosene fractions, differing very little from straight cut kerosene. It has a flash point of 110 to 150 degrees F (43 to 66 degrees C) and a comparatively low vapor pressure of approximately 07.1 psi at 100 degrees F. Because of these characteristics, JET A is the preferred fuel used in turbine-powered commercial aircraft. The military equivalent designation for JET A is JP-5 which is generally considered a more desirable alternate fuel than JET B (JP-4).

JET A-1 Type JET A-1 fuel is a blend of kerosene fractions differing from JET A only in terms of its lower freeze point. Wide-cut JET B (JP-4) is usually preferred as an alternate JET A fuel in lieu of JET A-1 because of its better engine re-start characteristics. The military equivalent of JET A-1 is JP-8.

JET Type JET B fuel is a blend of gasoline and kerosene fractions. Its flammability limits are approximately the same as aviation gasoline, with a flash point of 0-20 degrees F and a vapor pressure, at 100 degrees F, of approximately 2.75 psi. The military equivalent of JET B is JP-4 which has a lower freeze point and additives required by the military. Jet B and JP-4 are generally referred to as wide-cut fuels. Jet B and JP-4 is used as an alternate fuel only when authorized.

In terms of volatility, or tendency to form flammable fuel-air vapors, JET B and its military counterparts, JP-4, are considered highly volatile fuels. These fuels will form flammable vapors at temperatures of approximately -20 degrees F with increasing volatility at higher temperatures. JET A, JET A-1, and JP-5, in turn, are generally regarded as low volatility fuels. These fuels contain comparatively higher percentages of hydrocarbons and generally do not form flammable vapors at temperatures lower than 100 degrees F.

CAUTION: AT SOME STATIONS, JET A, A-1, OR JP-5 MAY NOT BE AVAILABLE, AND JET B OR ITS MILITARY COUNTERPART, JP-4 MAY HAVE BEEN LOADED AS AN ALTERNATE FUEL. DEPENDING
R ON CONCENTRATION, THE RESULTING MIXTURE WILL HAVE A FLASH POINT MUCH LOWER THAN ANTICIPATED. THIS PRESENTS AN ADDITIONAL HAZARD FOR PERSONNEL ACCUSTOMED TO DEALING ONLY WITH AVIATION KEROSENE BASE FUEL. THIS FACTOR MUST BE CONSIDERED WHEN DETERMINING FIRE AND HEALTH SAFE FUEL VAPOR CONCENTRATION LEVELS WHEN ENTERING FUEL TANKS.

The practice of fueling an aircraft with a product of significantly different flash point and vapor pressure than the residual fuel on board the aircraft is referred to as switch loading.

R CAUTION: EXTREME CAUTION SHOULD BE USED WHEN SWITCH FUELING. D.O.T. ORDER 8110.34A, DATED 31 MARCH 1980 MUST BE FOLLOWED.

C 6. Tank Entry (Refer to G.P. & P. Chapter 9)

7. Tank Sealing

A. Sealing Compounds

R Polysulfide, liquid polymer type compounds (Ref. 20-28-03) are used as fuel barrier sealants in integral tank areas. When mixed with proper proportion (by weight) of catalyst or accelerator, two-part mixture cures by chemical reaction to consistency of solid rubber. Base material and accclerator are supplied in contrasting colors so that uniformity of color can be used as an indication of proper mixture. Although various sealants having slightly different properties are procured under same product specification number, varying formulations (indicated by class, type, and vendor dash number) are available to satisfy different viscosity requirements and application time limits.

Curing commences the moment accelerator is added to base compound and is the time period required for mixture to set-up to hardness permissible for exposure to fuel.

Application life is the time, after mixing or thawing, during which sealant retains workable consistency suitable to its particular use. Both cure time and application life are based on standard conditions of 77 degrees F (25 degrees C) and 50 percent relative humidity (Ref. Table 201). Application life varies with relative humidity, ambient temperature, and temperature of sealant. High relative humidity and temperatures above 95 degrees F (35 degrees C) shorten application life while lower humidity and temperatures lengthen it. The time for complete curing is affected by relative humidity and temperature in the same manner as application life. Below 65 degrees F (18.3 degrees C) sealant will remain tacky and not cure until exposed to higher temperatures (except for special quick repair PR 1435 formulations). Accelerating the cure by circulating filtered warm air across sealed area is a standard maintenance practice. Sealant application life is ended when it can no longer be easily spread without adhering to applicator tool or brush.

Sealant Application, Assembly, and Cure Times (Hours)
Table 201

	LCM 40-2180	LCM 40-1218	LCM 40-2121 CLASS B12 & B24		
	TYPE I & II	TYPE I & II	TYPE I	TYPE II	PR 1435
Application Life	2	1/2	12	24	1/4
Assembly Time	2	1/2	20	80	1/4
STANDARD CURE:					
Time at 77(±10)°F and 50% Relative Humidity	72	24	180	240	24 (above 40°F)
ACCELERATED CURE:					
Time at 75(±10)°F	1/2	1/2	24	24	
PLUS					
Time at 125(±10)°F	3	1	12	24	

In Table 201, sealant application life and assembly times are listed for standard conditions of 77 degrees F (25 degrees C) and 50 percent relative humidity. Maximum application life and assembly time occurs at 95 degrees F (35 degrees C) and 55 percent relative humidity. Higher temperatures and humidity shorten application life and assembly time while accelerating cure time. Lower temperatures and humidity have the opposite effect. Under higher than standard conditions, fast cure LCM 40-1218 sealants must be cooled and maintained at approximately 70 degrees F in order to achieve a workable application life. Sealants will not cure below 60 degrees F (15.6 degrees C) or if relative humidity is lower than 20 percent.

Application life, assembly time, and cure times start when sealant is mixed or frozen material is thawed.

B. Availability and Types of Sealants

For most tank sealant repairs and tank maintenance requirements, only a small amount of sealant is necessary. Small quantities (one-half and one pint containers) are available in two-part kits for on-the-job mixing. Sealant may also be procured already mixed and frozen in polyethelene cartridges for use in Semco sealant guns. The material may also be ordered in Semkits. Semkits are cartridges of unmixed sealant in which base material and accelerator are separated until required and then mixed in the cartridge. The cartridge fits the standard Semco sealant gun.

LCM 40-2180 Type I and LCM 40-1218 Type I are filleting sealants, differing only in application life and cure times. LCM 40-2180 Type I may be ordered pre-mixed and frozen and stored at -20 degrees F (-28.9 degrees C) or lower, until thawed for use. The material may also be procured, for storage at room temperature, in two-part kits or Semkit cartridges and hand-mixed when required. Because of its extremely short application life, it is not practical to pre-mix and store LCM 40-1218 Type I sealant. It is therefore supplied only in two-part kits and Semkit cartridges and hand mixed when required. LCM 40-1218 Type
R II and LCM 40-2180 Type II sealants are similar to Type I
R sealants, except that Type II sealant is formulated to a brushing consistency for top coating applications.

LCM40-2121 Type I and Type II, Class B12, and B24 sealants are faying surface type compounds specifically formulated to permit varying application lives and assembly times. The material may be procured pre-mixed and frozen or in two-part kits and Semkit cartridges for hand-mixing on the job. LCM 40-2121 sealants do not cure when exposed to air and are therefore used only in faying surfaces and fastener installations.

PR 1435 sealant is a quick repair sealant specifically developed for repairing leaks in integral fuel tanks when minimum aircraft down time is of importance. The mixed compound is best applied by brush or spatula. Complete curing will take place under fuel. The material is usable down to 40 degrees F, however, it will not cure at lower temperatures.

R A film of MIL-C-27725 corrosion preventive coating is applied to all detail parts of integral tank structure (including fuel system plumbing) during manufacture. A blue-green dye is added to the coating in the lower 6 inches of the tanks to provide an easily visible means of detecting any breaks or scratches that could occur during maintenance

activities. Workmen must take extra precautions at all times to avoid damaging the coating. Damaged areas must be repaired before tank closure by applying a brush coating, approximately 0.01 inch thick, of LCM40-2180 Type II.

C. Storage and Handling of Sealants

Sealant that is procured pre-mixed and frozen must be immediately stored at -20 degrees F (-28.9 degrees C) or less until thawed for use.

Sealant that is mixed on site and retained for future use must be quick-frozen as soon as possible and in no case later than 10 minutes after mixing. This may be accomplished by immersing the sealant container in a slurry of dry ice for approximately 10 minutes and then transferring the container to a refrigerator maintained at -20 degrees F or less.

NOTE: Time consumed in freezing, storage, and thawing of sealant will reduce application life 45 minutes or more. This factor should be considered when viewing application and assembly time limits listed in Table 201.

Two-part kit containers and Semkits of unmixed sealant must be stored in unheated areas away from direct sunlight.

Sealant is best thawed by blowing compressed air across the sealant container. Heating by warm air (not more than 140 degrees F) will hasten thawing, but is not recommended because it will accelerate curing and reduce application life.

Do not re-freeze sealant that has previously been frozen and thawed.

R Sealant must be at a temperature of 60 degrees F (15.6 degrees C) or higher before use. If dew point temperature is above 60 degrees F, sealant must be heated to a temperature above dew point.

R
R

WARNING: A COMPONENT OF SEALANT ACCELERATOR IS READILY ABSORBED THROUGH THE SKIN. USE VINYL GLOVES WHEN HANDLING AND APPLYING SEALANTS AND CHEMICAL GOGGLES WHEN SEALANT COULD BE DROPPED INTO THE EYES. REMOVE SEALANT FROM THE SKIN BY RUBBING WITH C-32-337 CLEANER, FOLLOWED BY SOAP AND WATER WASH.

AVOID REPEATED OR PROLONGED BREATHING OR VAPORS FROM LCM 40-2180 TYPE 11 AND PR 1435 SEALANTS AS THEY CONTAIN A SMALL AMOUNT OF METHYL-ETHYL-KETONE. APPLY THESE SEALANTS ONLY UNDER ADEQUATE VENTILATION, OR WEAR AIRLINE RESPIRATORS.

D. Mixing of Sealant (Two-Part Kit)

(1) Separate containers of base compound and accelerator.

(2) Empty accelerator into container of base compound. Be certain to transfer all of the accelerator, removing all that can be scraped from surfaces of container.

(3) Thoroughly mix the two compounds using a wooden spatula. Use a slow consistent motion. (Rapid stirring will produce a rise in material temperature and entrapment of air bubbles.) Move the spatula through all portions of the container to include all base compound in the mix. Continue mixing until a uniform color showing no streaks or bubbles is attained.

(4) Check the mix for uniformity of mixture by spreading a small amount on a sheet of paper or scrap metal. An uneven mix will be evident by streaks of accelerator and non-uniformity of color.

E. Mixing of Sealant (SEMKIT)

(1) Pull dasher rod out of the cartridge until the dasher blades are near nozzle end of cartridge.

(2) Insert ramrod in hole at end of dasher rod and push in until the red cap seals off hole. At this point accelerator is completely discharged into base compound.

(3) To mix, push dasher rod to bottom of cartridge and begin stroking the rod in a clockwise spiral motion from bottom to top of cartridge and back to bottom, at a rate of 5 spiral revolutions per stroke. Continue for approximately 50 strokes. End mixing action with dasher rod in full out position.

R (4) Hold cartridge in an upright position. While gripping
R cartridge tightly in area of red seal to keep dasher
R blades turning, unscrew dasher rod in a
R counterclockwise direction and remove it.

R (5) Screw a nozzle into cartridge, remove snap-on cap, and
R place cartridge in sealant gun.

F. Surface Preparation

To obtain good sealant adhesion, surfaces must be thoroughly cleaned to remove all contaminants, oil, and wax residues. Whenever possible all drilling, deburring, and fitting of parts shall be done prior to cleaning and sealing. Prepare surfaces to be sealed as follows:

(1) Remove all drill chips, fastener parts, and miscellaneous trash by hand sweeping and vacuuming.

NOTE: Use only clean, dry, grease and soap-free lintless rags conforming to specification DDD-R-30, Class 1, Grade A.

(2) Wipe surface with a clean rag dampened in LCM 32-1087 or C-32-337 cleaner. Follow immediately by drying with a second clean dry rag. Do not permit solvent to evaporate.

NOTE: To avoid displacing contaminants and residues from one cleaned area to another, always pour cleaner onto the rag. Do not dip rag in cleaner. After each wipe, use an unused clean section of the rag. Change rags often.

R Do not clean by pouring cleaner onto surface. This practice will permit cleaner to enter faying surfaces and require an extended time of
R applying heated air to evaporate cleaner.

(3) Where solvent has entered faying surfaces, apply heated air (120 to 140 degrees F) for at least 6 hours before applying sealant.

G. Application of Sealant (Faying Surfaces)

R All detail parts which form integral fuel tank boundaries, including stiffeners and doublers, tank separation ribs, surge and vent box walls, structure and permanently installed parts on either wet or dry sides of tank boundaries, fittings, and permanently mounted equipment are faying surface sealed with LCM 40-2121 sealing compound.

When such components are replaced, they must be reseated as follows:

(1) Using plastic or phenolic scrapers, thoroughly remove all cured fillet and faying surface sealant from tank structure to which part is attached. Clean both faying surfaces of joint as in Step 5F.

(2) Use a sealant which will enable installation of part, including all fasteners, within application life of sealant.

(3) Apply a uniform layer of sealant over entire faying surface area of part being installed using a sealant comb, paint roller, or spatula (Ref. Fig. 201). Sufficient sealant must be used to obtain a small amount of squeeze out along all edges of part after it is fastened.

(4) Install and tighten fasteners.

(5) Allow sealant to cure until it has a plastic tack-free condition.

(6) Remove extruded bead of sealant using a plastic or phenolic scraper. (Small beads approximately 1/32-inch in size need not be removed as they will be covered by fillet seal.)

(7) Apply fillet seal. Brush coat fasteners when brush coat is applied to fillets.

(8) Allow sealant to cure for the time specified in Table 201 before refueling.

NOTE: The edges of all faying surface sealed components are fillet sealed and brush coated with LCM 40-2180 Type I and II sealant. The fillet sealing material is the controlling factor in determining cure time.

H. Application of Sealant (Filleting)

Fillet sealing is applied to all permanently installed equipment, fuel tank vent boxes, and structural components forming fuel tank boundaries that have a potential leak path to tank exterior or adjoining tank. LCM 40-2180 Type I sealant is normally used for filleting. LCM 40-1218 Type I sealant is used under field repair conditions when limited applications life is sufficient to permit completion of sealant repair.

(1) Clean areas to be sealed in accordance with Step 5F.

R (2) Apply sealant using an extrusion gun with nozzle tip R facing in direction of nozzle movement, to avoid R entrapment of air bubbles. Use filleting tools to form R fillet bead and feather-edge bead to specified R dimensions (Ref. Fig. 201).

R (3) Allow seal to cure to a point where it is approximately tack free, then apply a brush coat of LCM 40-2180 Type II sealant.

(4) Permit sealant to cure for approximately 1/2 hour before applying heat for accelerated cure.

I. Application of Sealant (Brush Coating)

A brush-on coating of LCM 40-2180 Type II sealant is applied as shown in Figure 201 to the following areas:

(1) All fillets (one coat).

(2) All bolts, sheet metal nuts and dome nuts.

(3) All rivets, Hilok collars and pins, and taper pins penetrating the tank boundary (two coats except such fasteners that have been wet installed with the manufactured head on the fuel side of the tank boundary require only one coat).

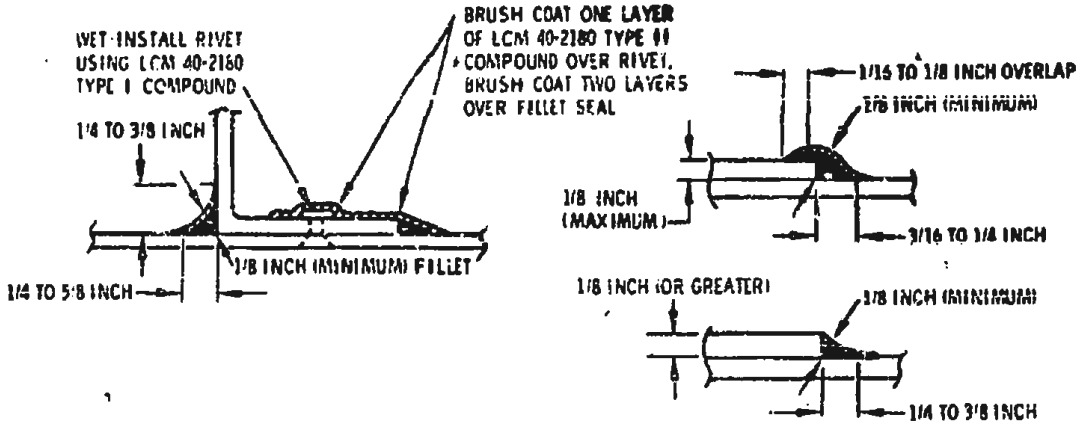
R (4) Rivet heads on the wet side of front wing beam between leading edge station 350 and 430 in the pylon area.

(5) All electrical bonding and ground connections, as shown in Figure 201. Where two coats of brush sealant are applied, the first coat must be allowed to cure until R tacky before applying second coat.

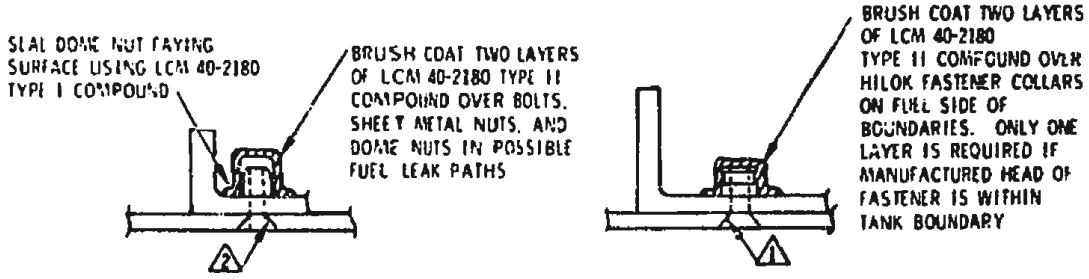
J. Installation of Fasteners

R All fasteners that penetrate fuel tank boundaries are wet R installed with LCM 40-2180 Type II or LCM 40-2121 Class B12 R sealants.

R (1) Wet install all fasteners that penetrate tank;tank tank R boundary or sealed structures. Coat bolt threads R before inserting bolt through support structure and component mounting flange. Add washer and nut and tighten to specified torque value. Then brush coat both bolt head and nut.


WET-INSTALL RIVET USING LCM 40-2180 TYPE I COMPOUND
BRUSH COAT ONE LAYER OF LCM 40-2180 TYPE II COMPOUND OVER RIVET, BRUSH COAT TWO LAYERS OVER FILLET SEAL
1/4 TO 3/8 INCH
1/4 TO 5/8 INCH
1/8 INCH (MINIMUM) FILLET
1/16 TO 1/8 INCH OVERLAP
1/8 INCH (MINIMUM)
1/8 INCH (MAXIMUM)
3/16 TO 1/4 INCH
1/8 INCH (OR GREATER)
1/8 INCH (MINIMUM)
1/4 TO 3/8 INCH

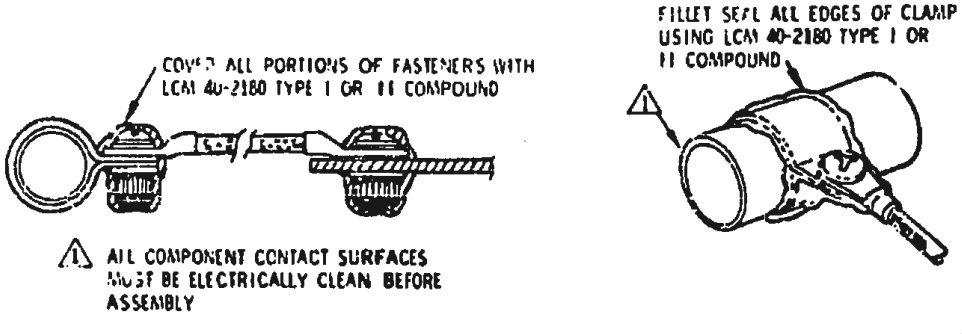
FILLET SEAL (TYPICAL)


SEAL DOME NUT FAYING SURFACE USING LCM 40-2180 TYPE I COMPOUND
BRUSH COAT TWO LAYERS OF LCM 40-2180 TYPE II COMPOUND OVER BOLTS, SHEET METAL NUTS, AND DOME NUTS IN POSSIBLE FUEL LEAK PATHS
BRUSH COAT TWO LAYERS OF LCM 40-2180 TYPE II COMPOUND OVER HILOK FASTENER COLLARS ON FUEL SIDE OF BOUNDARIES. ONLY ONE LAYER IS REQUIRED IF MANUFACTURED HEAD OF FASTENER IS WITHIN TANK BOUNDARY
1
2

NOTE

1. WET INSTALL PERMANENT FASTENERS USING LCM 40-2180 TYPE II OR LCM 40-2121 CLASS B1/2 COMPOUND
2. DO NOT PERMIT SEALANT TO CLOG THREADED AREAS OF FASTENERS SUBJECT TO REMOVAL FOR COMPONENT REPLACEMENT

TANK STRUCTURE FASTENER SEALING


COVER ALL PORTIONS OF FASTENERS WITH LCM 40-2180 TYPE I OR II COMPOUND
FILLET SEAL ALL EDGES OF CLAMP USING LCM 40-2180 TYPE I OR II COMPOUND
1
1 ALL COMPONENT CONTACT SURFACES MUST BE ELECTRICALLY CLEAN BEFORE ASSEMBLY

M1-0101-28-202

BONDING JUMPER INSTALLATION (TYPICAL)

Fuel Tank Sealant Application
Figure 201

(2) Most bolts that penetrate tank wall to secure components on fuel side of partition are screwed into flanges having integral floating nuts. Such bolts are installed dry. Where bolts are screwed into dome nuts secured to structure, or into integral dome nuts in faying surface sealed flanges, great care must be taken to prevent faying surface sealant from entering dome nut and freezing the nut.

(3) Permanently installed structural fasteners are wet sealed during installation and secured in accordance with instructions in the structural repair manual.

K. Field Repair of Faulty Sealant

(1) Remove sealant in leak source area using a suitable plastic or phenolic tool. Take care to avoid scratching through tank protective coating. Cut into good sealant at the repair boundary at a 45-degree angle.

(2) Remove any leak detector residue (if used) and thoroughly clean rework area as directed in Step 5F.

(3) Dry fuel-soaked sealant in the repair area using hot air or vapor-proof heat lamps.

(4) Prepare required quantity of LCM 40-1218 Type I sealant. Heat or cool base material as necessary to maintain sealant at approximately 75 degrees F. (Higher temperatures will cut down on application life.)

(5) Apply a thin adhesion coat to repair area, working sealant into tapered edges of good sealant. Allow to set for approximately 15 minutes, then apply sealant as necessary to restore filler to previous dimensions. Allow sealant to cure to a tacky consistency before applying a brush coat.

(6) Cure LCM 40-1218 sealant at temperature show in Table 201. Tank may be refueled one hour after repair.

NOTE: For minor repairs at temperatures below 65 degrees F, it is permissible to use PR 1435 sealant, in lieu of the LCM 40-1218. PR 1435 remains workable down to 40 degrees F, however, it will not cure below that temperature. Its application life under standard conditions is extremely short. Apply heat up to 130 degrees F to accelerate the cure. Tanks may be refueled one hour after repair.

8. Biocide Treatment of Fuel Tanks

A. General

Corrosion in fuel tanks can result from presence of microorganisms which live and multiply at the interface of fuel and water. The most effective way to prevent this problem is to reduce, if not eliminate, the amount of water retained in the tanks. Fuel tanks can also be treated periodically with a biocide to minimize problems arising from microbiological growth. If a tank inspection should disclose microbial growth, tank must be cleaned.

B. Procedure (Addition of BIOBOR JF)

WARNING: BIOBOR JF IS TOXIC. AVOID BREATHING OF VAPOR OR CONTACT WITH SKIN.

CAUTION: DO NOT ADD CONCENTRATED BIOCIDE TO FUEL TANK. ADDING CONCENTRATED BIOCIDE CAN RESULT IN HIGH, LOCALIZED CONCENTRATIONS WHICH FORM SALT DEPOSITS.

NOTE: The preferred method for adding BIOBOR JF is by metered injection into a flowing stream of fuel at a concentration of 250 ppm (by weight). If metered injection equipment is not available, proceed as outlined below.

(1) Distribute on-board fuel as in Table 202.

Fuel Distribution for BIOBOR Treatment
Table 202

TANK	QUANTITY
2L	12,825 lbs (5,815 Kg)
2R	12,825 lbs (5,815 Kg)
1	28,000 lbs (12,700 Kg)
3	28,000 lbs (12,700 Kg)
1A and 3A	Empty

(2) To obtain a BIOBOR JF concentration of 250 ppm, mix BIOBOR JF and fuel, in a suitable size container, as in Table 203 and add to fuel in tanks (Ref. Step 3).

BIOBOR JF Concentrate
Table 203

BIOBOR JF	FUEL	PREMIX
12.5 Kg (3.5 Imp Gal)	50 Kg (14.0 Imp Gal)	62.5 Kg (17.5 Imp Gal)
28.0 lb (4.0 U.S. Gal)	112.0 lb (16.0 U.S. Gal)	140.0 lb (20.0 U.S. Gal)

(3) Add premix equally to tanks 2L and 2R through the inboard tank overwing fill port.

(4) Turn on tank 2L and 2R boost pumps and open tank 2L and 2R defuel and fueling valves. Allow fuel to circulate between the inboard and outboard tank sections for a minimum of 30 minutes.

(5) Close tank 2L and 2R fueling valves and open both tank 1 and 3 fueling valves. Transfer 12,000 lbs (5,400 Kg) of fuel from tank 2L and 2R into tanks 1 and 3.

(6) Turn off tank 2L and 2R boost pumps and close tank 2L and 2R defueling valves.

(7) Turn on tanks 1 and 3 boost pumps and open tanks 1 and 3 defuel and fueling valves. Allow fuel to circulate through tanks 1 and 3 a minimum of 30 minutes.

(8) On aircraft 001-024, 027,
close tank 1 and 3 fueling valves. Open tank 2L and 2R fueling valves and transfer approximately 9,000 lbs (4,080 Kg) of fuel back to tank 2L and 2R. Terminate fuel transfer by closing tank 2L and 2R fueling valves.

(8) On aircraft 025, 026, 028-999,
close tank 1 and 3 fueling valves. Open tank 2L and 2R fueling valves and transfer approximately 8,000 lbs (3,625 Kg) of fuel back to tank 2L and 2R. Terminate fuel transfer by closing tank 2L and 2R fueling valves.

(9) On aircraft 025, 026, 028-999,
open tank 1A and 3A fueling valves and transfer approximately 1,000 lbs (450 Kg) of fuel from tank 1 and 3 into tanks 1A and 3A. Terminate fuel transfer by closing 1A and 3A fueling valves.

(10) Close tank 1 and 3 defuel valves and turn off tank 1 and 3 boost pumps.

(11) Allow treated fuel to soak at least 6 hours before filling tanks or running engines.

TANKS - ADJUSTMENT AND TEST

1. General

Tank 1A and 3A fuel/condensate scavenge systems operate only when the aircraft is airborne. When on the ground, both systems are deactivated by MLG air/ground sensors. This maintains fuel load distribution between wing center section and adjacent wing tanks.

One compound (multiple nozzle) and one single nozzle ejector pump located in each of the wing center section tanks, operate as fuel scavenging devices which constantly syphon fuel (and condensate) from the tank low (sump) areas. This fuel is directed into the companion tank 1 and 3 fuel boost pump boxes where it is combined with fuel pumped into the engine fuel feed lines. Motive fuel flow required for ejector pump operation is supplied by the respective tank 1 and 3 boost pumps through tank 1A and 3A scavenge valves which are automatically opened when the aircraft is airborne. The following checkout procedure is an operational check of the shutoff valves, ejector pumps, and electrical system which control system operation.

2. Referenced Procedures

24-00-00	Electrical Power - Maintenance Practices
28-24-00	Engine Fuel Feed System - Description and Operation
32-63-00	Air/Ground Sensing - Maintenance Practices

3. Adjustment/Test

A. Tank 1A or 3A Scavenge System Operational Test

NOTE: Tank 1A and 3A Scavenge Systems are automatically deactivated by MLG air/ground sensors when the aircraft is on the ground to prevent inadvertent overfilling of tanks 1 and 3.

(1) Verify that tanks 1A and 3A each contain at least 1000 pounds of fuel.

(2) On FE/SO aft circuit breaker panel, CB3, verify that the following fuel system circuit breakers are closed.

INBD PUMP IND (U1)

OUTBD PUMP IND (U15)

FUEL QTY IND (T2 and T5)

INBD BOOST PUMP - TANK - 1 and 3 (U7 and U10)

OUTBD BOOST PUMP - 1 and 3 (U13 and U14)

SCAVENGE VALVE - TANK 1A & 3A (U16)

(3) Apply external electrical power (Ref. 24-00-00).

(4) On FE/SO FUEL SYSTEM panel verify that the 1A XFR, 3A XFR, GRAVITY TRANSFER TANK 1A, and TANK 3A switches are released and that the XFR and blue valve in-transit lights are out.

R CR R CAUTION: IF BOOST PUMP CIRCUIT BREAKER TRIPS, DO NOT RESET UNTIL IT IS VERIFIED THAT CIRCUIT BREAKER TRIP IS NOT CAUSED BY MALFUNCTION IN BOOSE PUMP ASSEMBLY.

(5) Depress (latch) TANK 1A and 3A QTY/LOW switches. QTY lights must come on.

NOTE: TANK 1A and TANK 3A QTY/LOW switches must be depressed in order to read tank 1A and 3A fuel quantities.

(6) Turn on tank 1 and 3 boost pumps (Ref. 28-24-00). Verify that there is no decrease in tank 1A and 3A fuel quantities.

(7) Simulate an airborne condition at both main landing gear air-ground sensors (Ref. 32-63-00) and verify the following:

(a) In main wheel wells, scavenge valves have opened.

(b) Tank 1A and 3A fuel quantities are slowly decreasing.

CAUTION: BE SURE ALL ARTIFICIAL TARGETS ARE REMOVED FROM AIR/GROUND SENSORS.

(8) Restore MLG air-ground sensors to on-the-ground condition (Ref. 32-63-00).

(9) Verify that tank 1A and 3A scavenge valves have closed and fuel transfer to tanks 1 and 3 has stopped.

(10) Release (unlatch) tank 1A and 3A QTY/LOW switches. QTY lights must go out.

(11) Turn off fuel boost pumps.

(12) Turn off electrical power (Ref. 24-00-00).

TANKS - INSPECTION AND CHECK

1. General

The following inspection evaluates fuel tank leaks according to the severity of the observed leakage and includes a common guideline in determining if the aircraft can be released for further flight before repair of the leak is considered mandatory. If, during pressure fueling, fuel is spilled overboard through the vent openings, and the trouble was found to be a ruptured tube or failed tube coupling, it must be assumed that the wing tanks have been overpressurized and an inspection of the wing tank structure is mandatory (Ref. Para. 3B).

2. Referenced Procedures

6-50-00	Interior Access Doors and Removable Panels - Description and Operation
28-22-00	Defueling - Maintenance Practices
57-00-00	Structural Repair Manual
57-33-02	Upper Access Cover Plates - Removal and Installation

3. Inspection/Check

A. Fuel Tank Leak Evaluation (Ref. Fig. 601)

(1) STAIN

A stain is the slowest leak. It is characterized by a discoloration around fasteners or seams and is caused by a very slow fuel seepage which drys as it meets the air. A stain should be wiped off and should not reappear within 15 minutes.

(2) SEEP

A seep is defined as a heavy stain which reappears within 15 minutes after being wiped dry.

(3) HEAVY SEEP

A heavy seep recurs within one minute after being wiped off and spreads along the surface, but usually drys before dripping off structure.

(4) DRIPPING OR RUNNING LEAK

A dripping or running leak is a continuous flow of fuel which wets immediately after being wiped dry and actually drips off the wing surface.

B. Tank Inspection

(1) Inspect the wing box external surfaces and spars for bulges, fuel leaks, and tipped or dished fasteners.

NOTE: It is probable that there will be signs of fuel leakage from around the access covers on the lower surface of the wing.

(2) Tanks 2L and 2R.

R (a) Lower inboard tank fuel level below 12,000 pounds (Ref. 28-22-00).

WARNING: OBSERVE ALL FUEL SYSTEM WARNINGS AND PRECAUTIONS.

(b) Inspect OWS 78.4 rib-to-surface attachments (inside tank) for deformation and sheared or tipped fasteners at the following locations:

Lower surface stringers numbers 12, 13, and 14.

Upper surface stringers numbers 16 and 19.

NOTE: Access to this area may be obtained by removing upper surface access door 532AT or 632AT (Ref. 57-33-02) between OWS 52.5 and OWS 78.4.

(3) Tanks 1A and 3A. (Aircraft 025-026, 028-999).

(a) Remove access covers 141AZ and 147AZ for entry to forward and aft wing center section dry bay areas (Ref. 6-50-00).

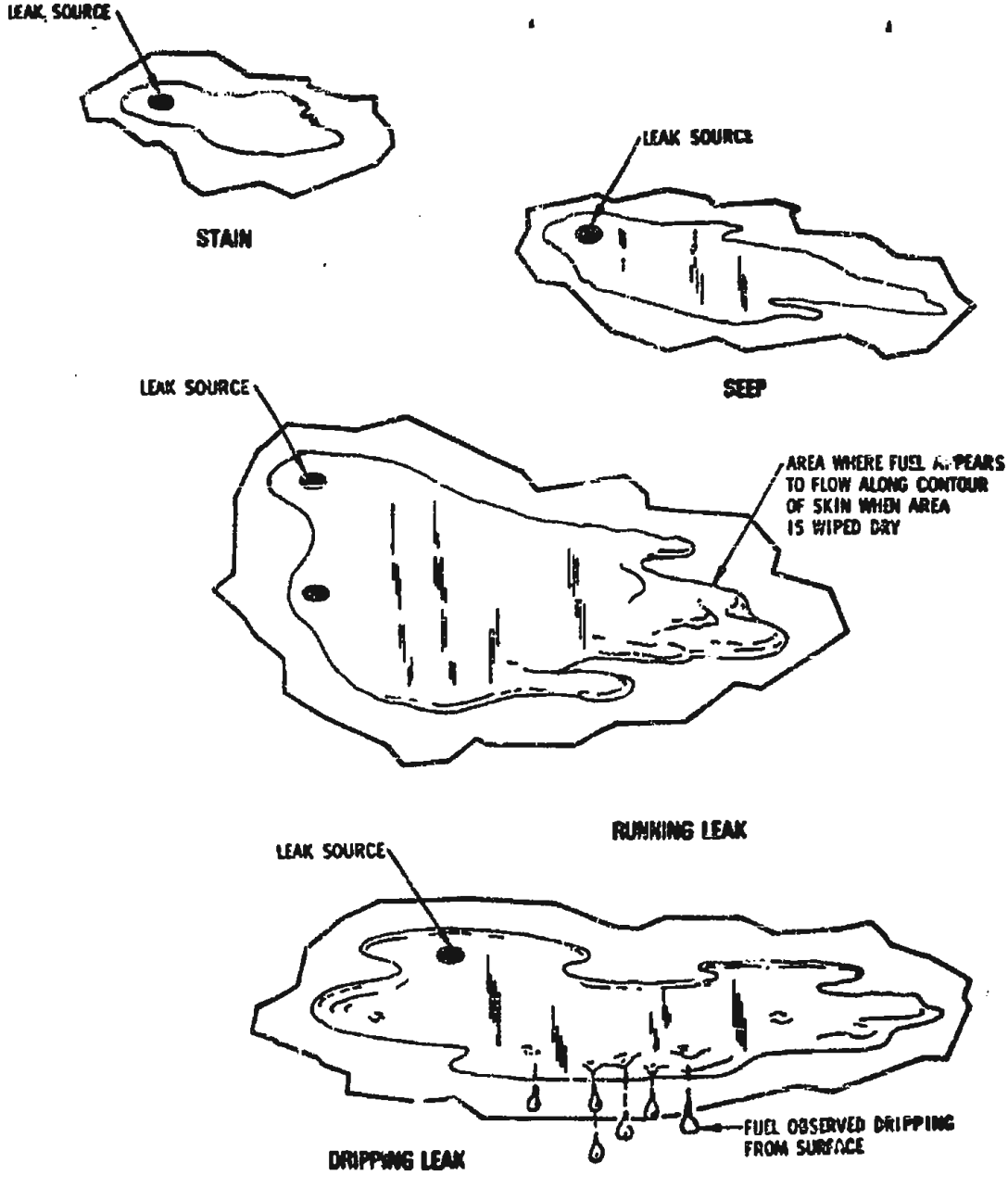
(b) Inspect FS 1103 (zone 141.3, and 141.4) and FS 1163 (zone 141.7 and 141.8) beams for fuel leaks, deformed web stiffeners (twisted or bent), bulged webs, and general condition of all fasteners. In Keelson area inspect wing center section lower

R surface structure for general condition and
R evidence of fuel leakage.

R NOTE: If the above inspection reveals any evidence of structural damage, the tanks must be defueled and thoroughly inspected for additional damage. The surface-to-rib attachments at all locations in tanks 2L and 2R must be inspected as indicated in Paragraph (2), and also OWS 440 bulkhead for evidence of damage. Where necessary, approved repairs (57-00-00 Structural Repair Manual) must be carried out before the aircraft can be released for service.

C. Fuel Tank Leak Repair Requirements

(1) Refer to Figure 602.



Fuel Tank Leak Evaluation
Figure 601

LEAKAGE LOCATION		REPAIR REQUIREMENT			
		STAIN	SEEP	HEAVY SEEP	RUNNING LEAK
A	EXPOSED WELL VENTILATED AREAS WHERE LEAKAGE CANNOT PROGRESS TO POTENTIAL FIRE SOURCE OR LEAK INTO ENCLOSED AREAS (WING SKIN SURFACES)	NOTE 1	NOTE 1	NOTE 2	NOTE 3
B	SEMI-ENCLOSED, PARTIALLY VENTILATED AREAS (FRONT AND REAR SPARS EXCEPT PYLON AREA)	NOTE 1	NOTE 1	NOTE 2	NOTE 3
C	ENCLOSED - PARTIALLY VENTILATED (WHEEL WELLS, FAIRINGS)	NOTE 1	NOTE 2, 4	NOTE 3	NOTE 3 (4)
D	ENCLOSED - FIRE HAZARD OR NON-VENTILATED AREAS (PYLON AREA - CENTER WING CAVITY WHERE BARRIER COATING APPLIED)	NOTE 1	NOTE 3, 4	NOTE 3	NOTE 3 (4)

NOTE

1 NO REPAIR REQUIRED. PERIODIC INSPECTION MUST BE MADE TO ASSURE LEAK DOES NOT INCREASE.

2 NO IMMEDIATE REPAIR REQUIRED. FREQUENT INSPECTION MUST BE MADE TO ASSURE THAT LEAK DOES NOT INCREASE. REPAIR SHOULD BE MADE AT NEXT AIRPLANE LAY-UP.

3 IMMEDIATE REPAIR REQUIRED BEFORE NEXT FLIGHT FOR LOCATIONS B, C, AND D. (RUNNING LEAKS ON SKIN SURFACES WHICH DO NOT TRAVEL INTO ENCLOSED AREAS OR POTENTIAL FIRE HAZARD AREAS SHOULD BE REPAIRED AS SOON AS POSSIBLE.)

(4) FUEL LEAKAGE FROM THE WING BOX INTO THE PYLON FAIRING IS CONSIDERED A TYPE "C" LEAKAGE. LEAKAGE FROM A FUEL LINE OR OTHER SOURCE INTO THE PYLON BOX STRUCTURE IS CONSIDERED TYPE "D" LEAKAGE.

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CR

Fuel Tank Leak Repair Chart
Figure 602

EFFECTIVITY: ALL

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FUEL TANKS - APPROVED REPAIRS

1. General

R A. Due to the number of possible leak paths created by buildup
R of structure during assembly of the wing, locating the
R source of a fuel leak in the MLG trunnion fittings may be
R difficult. A leak at this location would most likely appear
R between the lower beam cap and either the skin or the steel
R doublers on either side of the torque box trunnion fitting.
R In order to inhibit further leakage in this area, the
R following must be accomplished:

(1) Sealant must be injected between the back-to-back bath tub fittings and lower spar cap. This eliminates a channel from sixth stringer to the rear beam.

(2) Random fasteners must be removed from the thin part of MLG rail common to the lower panel and steel doubler and sealant injected.

R (3) Samples of fillet sealant are removed from suspect
R areas and analyzed. If sealant is of poor quality the entire area is stripped and re-fillet sealed.

R B. Fuel seepage from the external spar web joint at inner wing
R station (IWS) 550.00 can be caused by inadequate sealing of
R the back-to-back wing rib to rear spar attach angles. The procedure in Paragraph 4C suggests a method for finding the
R source of such leakage and renewing the fillet sealing at
R the rib attach angles at this location.

R C. Loose particles of polyurethane tank lining can result in
R jet pumps, screens, and filters becoming clogged and
R inoperative. The procedure in Paragraph 4D suggests a
R method for repairing areas where the coating has come loose.

2. Equipment and Materials

Sealant Gun, Grover Mfg Corp., Model 223, or equivalent

High pressure flexible hose (6000 psi) with male and female 1/8 NPT fittings

Injection pin for MLG Trunnion Bolts (G/ITEL item 28-11-03)

Injection Pin for Hi-tigue fasteners (G/ITEL item 28-11-04)

O-ring washer to fit injection pins

Sealing Compounds:

Fillet Material, 2 hr. application Life, LCM 40-2180 Type I, or equivalent (Products Research Co. PR 1422 B-2 is an approved equivalent)

Brush Material, 2 hr. application Life, LCM 40-2180 Type II, or equivalent (Products Research Co. PR-1422A-2(W) is an approved equivalent)

Brush Material, 1/2 hr application Life, Product Research Co. PR-1422A-1/2

Chlorinated Cleaner, LAC 32-337, or equivalent (Turco Products Co. No. 657, Penwatt Corp. No. 2083, Leeder Chemicals Co. No. 885, West Chemical Products No. 1484, Cee Bee Chemical C-50 are approved equivalents)

Scotchbrite pads, or equivalent (3M Mfg. Co.)

R Click Patch Repair Kit, SEMCO (Products Research and Chemical
R Corporation)

3. Referenced Procedures

	6-40-00	Exterior Access Doors and Panels - Description and Operation
	7-11-00	Wing and Fuselage Jacking - Maintenance Practices
R	12-11-11	Pressure Fueling - Servicing
	24-00-00	Electrical Power System - Maintenance Practices
	28-11-00	Fuel Tanks - Maintenance Practices
	28-22-00	Defueling - Maintenance Practices
	57-33-01	Cover Plates and Access Doors - Removal and Installation
	51-40-01	Fastener Installation and Removal - Structural Repair Manual

4. Approved Repairs

A. Main Landing Gear Torque Box Fitting and Rear Spar Web

(1) Defuel tank 1 or 3 or transfer fuel to another tank (Ref. 28-22-00).

(2) Jack the airplane (Ref. 7-11-00).

(3) Purge and ventilate tank (Ref. 28-11-00).

R (4) Open access door 541EB/641EB.

(5) In MLG wheel well and inside torque box remove lower MLG trunnion bolt nuts and washers (Ref. Fig. 801).

(6) In the tank on both sides of IWS 346 rib remove tension bolt retainers from lower trunnion bolts. Remove bolts.

(7) Use a plastic scraper and remove sealant from around bolt holes.

(8) Clean area around bolt holes using clean rag wet with cleaning solvent.

(9) Install O-ring washer under head of injection pin.

(10) Install pin in inboard hole with head inside tank.

(11) Install O-ring washer and nut on pin on outside of tank.

(12) Fill sealant gun chamber with cleaning solvent, Methylene Chloride.

(13) Using high pressure flexible hose extension, inject solvent on inside of tank into injection pin. Solvent should extrude on exterior of tank between torque box back-up fitting and rear spar web.

(14) Repeat Step (13) for outboard hole if solvent appears in hole.

(15) Load gun chamber with brush type sealant, LCM 40-2180 Type II

(16) Inject sealant into injection pin until sealant extrudes completely around the bottom periphery of the torque box fitting, between the spar web and the back-up fitting up the sides. Continue pumping sealant so that enough sealant is extruded to ensure cleaning of faying surfaces of the fuel leak path.

(17) Repeat Steps (15) and (16) for outboard hole if solvent appeared in hole in Step 14.

(18) Remove injection pin and reinstall the two lower trunnion bolts, washers, and nuts, wet with sealant, LCM 40-2180 Type II.

(19) Install tension bolt retainers.

(20) Torque trunnion bolt nuts to 715 to 750 ft lb within one hour after injecting sealant.

(21) Remove airplane from jacks.

(22) Clean off bolt heads with solvent and reseal bolt heads with sealant PR 1422A-1/2 or -2.

(23) Allow sealant to cure for 24 hours above 70°F or 6 hours above 100°F.

(24) Close fuel tanks (57-33-01).

(25) Fuel tank (Ref. 12-11-11) and check for leaks.

B. Skin and Beef-up Rail (IWS 346) and Other Skin Areas

(1) Defuel tank or transfer fuel to another tank (Ref. 28-22-00).

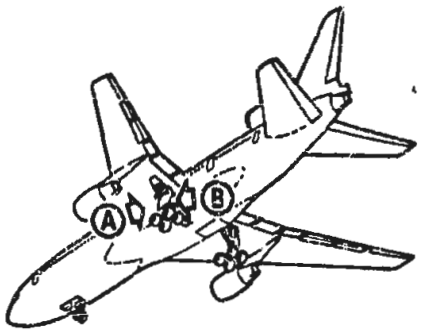
(2) Purge and ventilate tank (Ref. 28-11-00).

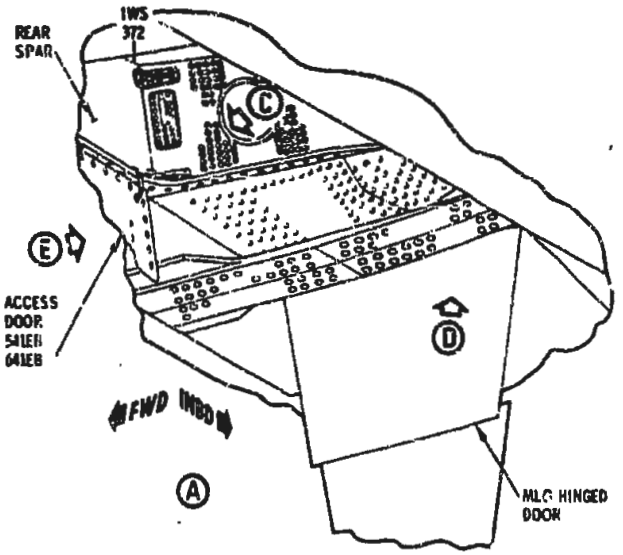
(3) Inside tank remove sections of fillet seal in vicinity of fuel leak and inspect for quality. There must be no blisters, voids or other signs of no adhesion.

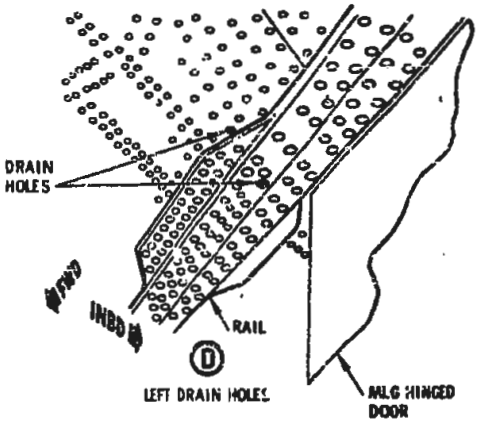
(a) If non-adhesion is evident, fillet seal in surrounding area must be removed and area resealed (Ref. 28-11-00). If fillet seal is in good condition or if leak persists, proceed to Step (4).

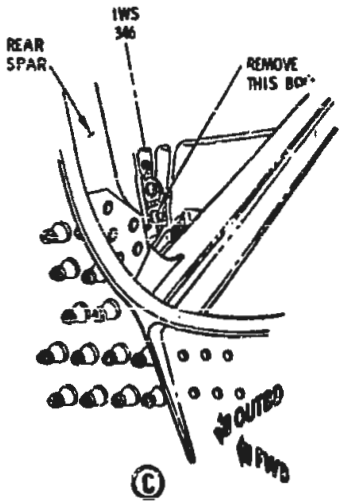
(4) Three or four hi-tigue fasteners (Ref. 57-40-01) not adjacent to each other must be removed which attach the lower skin and beef-up rail to the lower spar cap, the steel doubler and the stringer back-up fittings, in the vicinity of the attachment of the IWS 346 rib to the rear spar and lower skin (Ref. Fig. 801). It is recommended that every other fastener and the fasteners closest to the thickest portion of the exterior beef-up rail at the intersection of the skin attachment to the spar cap and rib back-up fittings be removed.

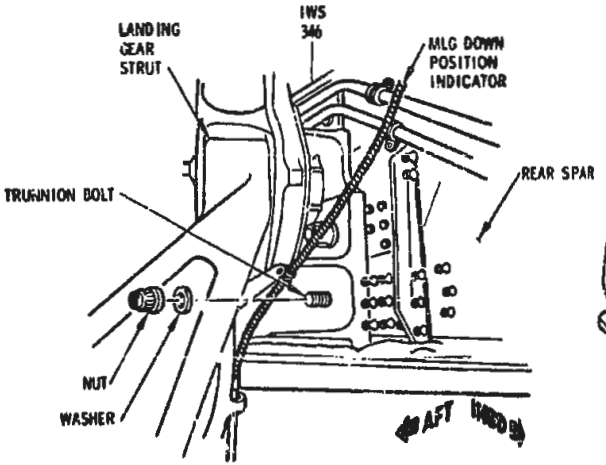
(5) Install correct diameter injection pin into one of the hi-tigue holes with an O-ring washer under the head and



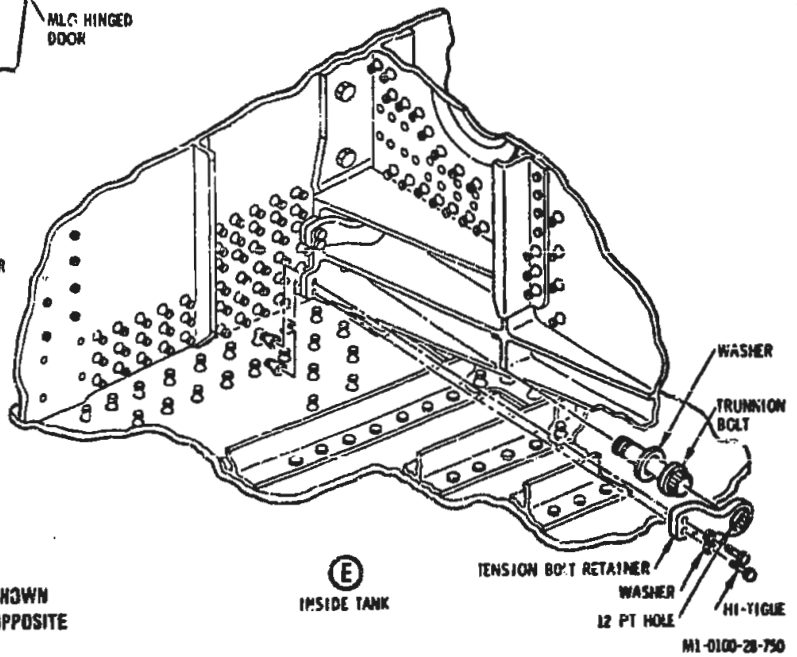








TANK 1 SHOWN
TANK 3 OPPOSITE



R Main Landing Gear Trunnion and IWS 346 Fuel Tank Leak Repair
R Figure 801

R EFFECTIVITY: ALL
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under the nut. In most cases, this should be done with the head on the exterior of the tank.

(6) Fill sealant gun chamber with cleaning solvent, Methylene Chloride.

(7) Using high pressure flexible hose extension, inject solvent into injection pin. Solvent should extrude between layers of structure at the next open hole.

(8) Repeat Step (7) for all open holes where solvent appears.

(9) Fill injection gun with sealant LCM 40-2180 Type II and inject sealant into the pin until sealant extrudes between layers of structure at the next open hole. Continue pumping sealant so that enough sealant is extruded to ensure cleaning of faying surfaces of the fuel leak path.

(10) Remove first installed injection pin and install required injection pin which fits into hi-tigue hole with extruded sealant. Inject sealant into second injection pin until sealant extrudes at another open hole, or out water drain hole aft of rear spar of the torque box.

(11) Continue above injection procedure until all hi-tigue holes extrude sealant injected from different open holes. If possible, continue injection until some sealant extrudes from some seam along a joint inside tank near the subject area.

(12) The above injection procedure should be accomplished both inboard and outboard of thick portion of beefup rail at the rear spar intersection.

(13) Immediately after completing injection procedure in all open holes, reinstall hi-tigues (Ref. 57-40-01) while sealant is still in a wet condition.

(14) Clean internal portions of hi-tigue fasteners and along joints where fillet sealant has been removed or damaged during injection procedure with solvent and clean rags.

(15) Brush coat internal portions of the reinstalled hi-tigues with approximately 0.025" thickness of PR 1422 A-2 sealant.

(16) Fillet seal joints requiring sealing with PR 1422B-2 sealant.

(17) Clean all sealant from both drain holes in torque box.

(18) Allow sealant to cure for a minimum of 24 hours above 70°F or a minimum of 6 hours above 100°F before closing fuel tank.

R (19) Refuel tank (Ref. 12-11-11) and check for leaks.

C. Inner Wing Station 555

(1) Prepare tank 2L or 2R (as required) for entry (Ref. 28-11-00).

(2) Remove access door 532/632 CB for access to inner wing station rib 555.00.

(3) At the wing rib-to-rear spar attach structure, inspect the tank sealant for obvious sources of fuel leaks. Look for discontinuities, voids, and lack of sealant adhesion in the filleting and fastener coating sealant. Also, look for signs of excessive shrinkage, loss of luster, discoloration, loss of elasticity, pinholes, poor cohesiveness at sealant bead intersecting points, and smudging of the fingertips when rubbed across the sealant. Make sure that a fillet bead exists at all edges of the rib attach angles at both wing rib and spar surfaces, and around all edges of the tee shaped brackets at the upper and lower spar cap angles (Ref. Fig. 802).

(4) If the leak source cannot be definitely determined by visual inspection, apply air pressure at the external spar web splice and check the tank interior using a soap bubble solution. Be aware that the source of the fuel leak may not be directly opposite the spot where external leakage is observed. Proceed as follows:

(a) Using an air hose and nozzle apply a 90 to 100 psig blast of clean air. Hold air nozzle at least one-half inch from the web splice.

(b) As air pressure is applied, soap the entire rib-to-spar attach joint. Note all locations where bubbles are observed.

(c) If the preceding step fails to disclose the leak source, locate points of poor sealant adhesion by applying air pressure (as above) to the filleting beads and apply bubble solution to the external web splice.

(5) Remove faulty sealant using a phenolic or plastic scraper. Scarf the edges where good sealant remains, allowing a minimum of one-half inch overlap between existing good sealant and new sealant. If the fuel leak cannot be localized to a small portion of the sealant area, remove all sealant at the periphery of the angles on both sides of the rib and from around the edges of the spar cap attach brackets.

(6) Prepare the areas to be resealed (Ref. 28-11-00).

(7) Apply new sealant (Ref. 28-11-00). Filleting sealant must be applied to all edges of the spar cap brackets and rib attach angles at both spar webs and rib surfaces, and over all fasteners (Ref. Fig. 802).

(8) Allow time for sealant to cure (Ref. 28-11-00).

(9) Refuel the tank and check spar web joint for leakage.

D. Repair of Polyurethane Tank Coating

(1) Defuel tank (Ref. 28-22-00).

(2) Purge and ventilate tank (Ref. 28-11-00).

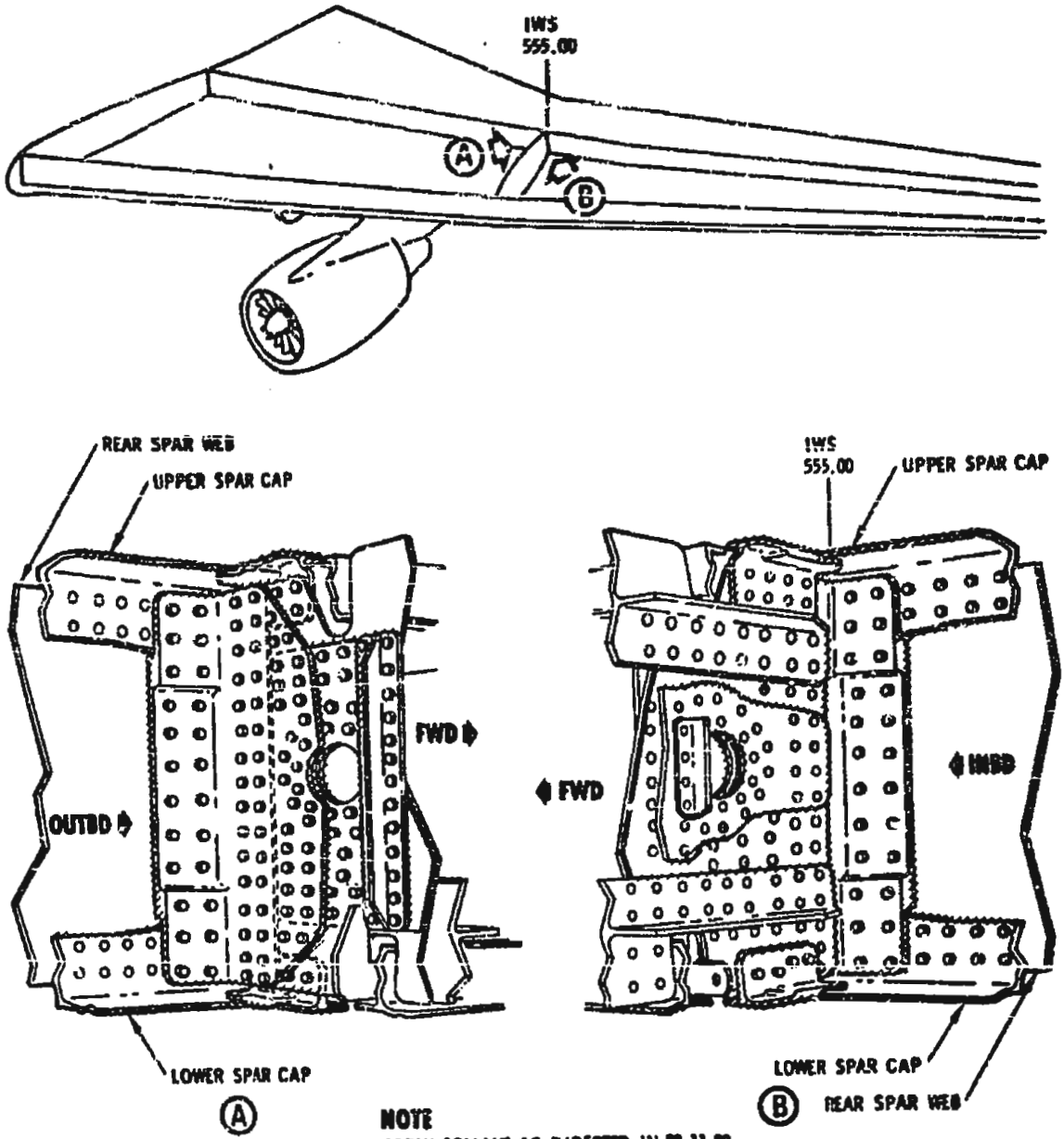
(3) Open access doors as necessary (Ref. 57-33-01).

(4) Inspect all tank surfaces for integral fuel tank coating which exhibits blisters, flaking, or other suspect sub-standard adhesion. Adhesion of the coating may be tested by firmly scraping the coating of the suspect area with the broad edge of a non-metallic scraping tool such as a sharpened micarta blade. Determine the extent of the loose coating by scraping the loosened areas until coating is located that cannot be chipped or flaked with vigorous scraping.

R CAUTION: UNDER NO CIRCUMSTANCES SHOULD STEEL WOOL OR OTHER METAL TOOLS OR BRUSHES BE USED FOR THIS PROCEDURE. EXTREME CARE MUST BE EXERCISED TO INSURE AGAINST DAMAGING ANY SEALANT MATERIALS IN THE FUEL TANKS.

(5) All inadequately bonded coating must be completely broken loose from the tank structure by vigorously scrubbing with 3M Scotchbrite or brushing with stiff non-metallic bristle brushes.

(6) All areas where loosened coating has been removed must be faired into solidly bonded coated areas by scotch briting.



Fuel Tank Sealant Application - IWS 555
Figure 802

R

R EFFECTIVITY: ALL

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(7) Vacuum all coating chips and other debris from the tanks.

(8) Wipe all tank surfaces with clean, lint free rags dampened with water. Wipe dry with clean, dry, lint free rags.

CAUTION: UNDER NO CIRCUMSTANCES SHOULD ANY NEW APPLICATION OF MIL-C-27725 BE MADE ON TANK INTERIORS.

(9) If coating on lower skin surface only is damaged to bare metal, it should be repaired by applying a brush coat (approximately 0.015-inch thick) of PR 1422 A-1/2.

R E. Click Patch Temporary Fuel Leak Repair

R NOTE: In general, all leaks should be permanently repaired R inside the tank as soon after discovery as R practicable. However, under certain circumstances R and conditions a temporary external repair may be R made if it is considered safe to operate the aircraft R until regularly scheduled maintenance is possible. R During these repair procedures the tank repair R specialist should observe all safety precautions R (Ref. 28-11-00).

R The decision to make a temporary external repair R should be based on safety considerations as R determined by the location of the leak exit point and R the amount of leakage. It is recommended that R temporary repairs be kept to an absolute minimum and R inspected frequently.

R External patch leak repairs are made using a SEMCO R click patch kit. This kit contains a 1.250-inch R diameter anodized aluminum patch, two-part epoxy R adhesive, mixing pad and spatula, solvent wipe, a R scotchbrite pad surface abrader, and an instruction R sheet. The patches are either flat or hat-shaped for R use over protruding-head fasteners.

R Click patches must not be installed until it is R determined that there are no structural cracks in the R area of the leak.

R Although defueling of the aircraft is not necesssary R when installing an external patch, the fuel level R should be reduced to a point so that the repair area R remains dry during repair.

R (1) Click Parch Installation

R CAUTION: DO NOT USE THE SURFACE ABRADER PROVIDED IN
R THE KIT. IT WILL REMOVE THE ANODIZE FINISH.

R (a) Use a solvent pad to clean the wing surface and
R the patch.

R (b) Puncture the epoxy tubes (2) at the neck end.
R Dispense all the material onto the mixing pad and
R mix thoroughly until the mixture becomes one
R color.

R (c) Apply a small amount of epoxy to the center of the
R patch and allow it to settle out.

R (d) Remove the protective green tape from the patch.
R Center the patch over the leak location and press
R firmly on the outer edges.

R (e) Press firmly on the center of the patch to
R activate the click mechanism, forcing the patch
R and epoxy against the repair area.

R (f) When the mixing stick cannot be removed from the
R left-over epoxy, the patch cover can be removed by
R grasping the edge and peeling it up.

R (g) The repair is now complete and the excess material
R can be trimmed before total cure and surface
R painting, if required.

R (2) Click Patch Removal

R CAUTION: HEATING THE PATCH FOR REMOVAL IS NOT
R RECOMMENDED DUE TO POSSIBLE OVERHEAT DAMAGE
R TO AIRCRAFT STRUCTURE AND FINISH.

R (a) Freeze the patch using dry ice.

R (b) While the patch is cold, remove by prying the edge
R with a plastic scraper.

R (c) Refreeze the area and remove the remaining epoxy
R with a plastic scraper if necessary.

R

FLAPPER CHECK VALVES, TANKS 1 AND 3 SURGE BOX REMOVAL AND INSTALLATION

1. General

Flapper check valves P/N 740878-105 and 740878-107 are installed on the walls of tank 1 and 3 surge boxes. This removal/installation procedure is applicable to both -105 and -107 check valves.

2. Referenced Procedures

28-11-00	Fuel Tanks - Maintenance Practices
28-22-00	Defueling - Maintenance Practices
57-33-01	Access Cover Plates and Doors - Removal and Installation

3. Removal/Installation

WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF. 28-11-00).

A. Removal

R (1) Defuel tank 1 or 3, as applicable (Ref. 28-22-00).

R (2) Purge and ventilate tank (28-11-00).

R R (3) Remove wing access cover plate 531DB/631DB for access to boost pump surge box (Ref. 57-33-01).

(4) Using sharpened phenolic or plastic scraper, remove sealant around edges of flapper check valve (Ref. Fig. 401).

(5) Remove valve body fasteners (screw, washer, and nut).

(6) Dislodge valve body from surge box wall by breaking faying surface sealant bond between valve body and wall.

B. Installation

(1) Throughly clean old sealant from surge box wall faying surface.

(2) Apply thin coating of faying surface sealant (Ref. 28-11-00, Para. 5) to the valve body faying surface (Ref. Fig. 401). Mount valve on surge box wall and install fasteners (screw, washer, and nut). Tighten fasteners equally and only as necessary to seat valve body on box wall. (Unequal tension or overtorqueing of fasteners could distort valve body and impair proper seating of flapper on valve body seat.)

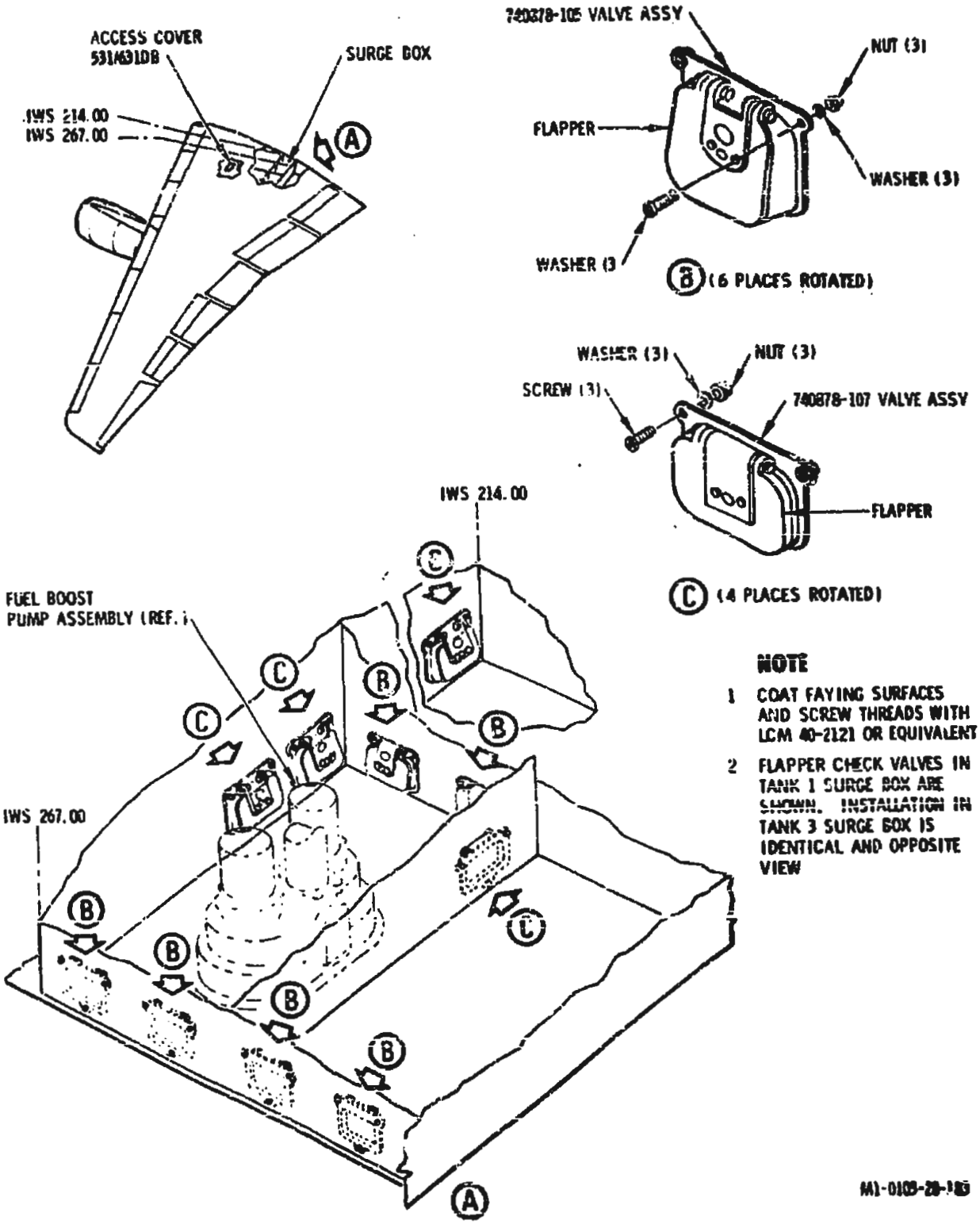
(3) Apply fillet seal sealant (Ref. 28-11-00, Para. 5) around the edges of the valve body. Apply thin brush coating of sealant over the fasteners.

(4) Check flapper for free movement and contact with all edges of the valve body seat. Be certain there is no sealant on the valve seat surfaces or hinge.

(5) Remove all tools and debris from work area.

(6) Allow sufficient time for sealant to cure (Ref. 28-11-00) before fueling tank. Note accelerated cure time possible by applying heat to rework area before vacating tank.

(7) Reinstall tank cover plates (Ref. 57-33-01).



R Flapper Check Valves, Tank 1 and 3 Surge Box
R Removal and Installation
R Figure 401

EFFECTIVITY: ALL

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FLAPPER CHECK VALVES, TANK 1 AND 3 SURGE RIBS REMOVAL AND INSTALLATION

1. General

Seven P/N 740878-101 and six P/N 740884-101 flapper type check valves are installed on the IWS 364.11 surge ribs in tanks 1 and 3. This removal installation procedure is applicable to both check valves.

2. Referenced Procedures

28-11-00	Fuel Tanks - Maintenance Practices
28-22-00	Defueling - Maintenance Practices
51-40-00	Fasteners - General
57-33-01	Access Cover Plates and Doors - Removal and Installation

3. Removal/Installation

A. Removal

(1) Defuel tank 1 or 3, as applicable (Ref. 28-22-00).

R WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF. 28-11-00).

(2) Purge tank (Ref. 28-11-00).

(3) Remove wing access cover plates 531DB/631DB and 531EB/631EB for access to both sides of the IWS 364.11 surge rib.

(4) Using sharpened phenolic or plastic scraper, remove sealant around edges of flapper check valve (Ref. Fig. 401).

(5) Remove valve body fasteners (screw, washer, and nut on valve 740878-101 valves, and rivet pin and collar on P/N 740884-101 valves, (Ref. 51-40-00)].

(6) Dislodge valve body from surge rib by breaking faying surface sealant bond between valve b dy and wall.

B. Installation

(1) Thoroughly clean old sealant from surge rib faying surface.

R (2) Apply thin coating of faying surface sealant (Ref.
R 28-11-00, Para. 5) to the valve body faying surface
R (Ref. Fig. 401). Mount valve on surge rib and wet
R install fasteners using sealant.

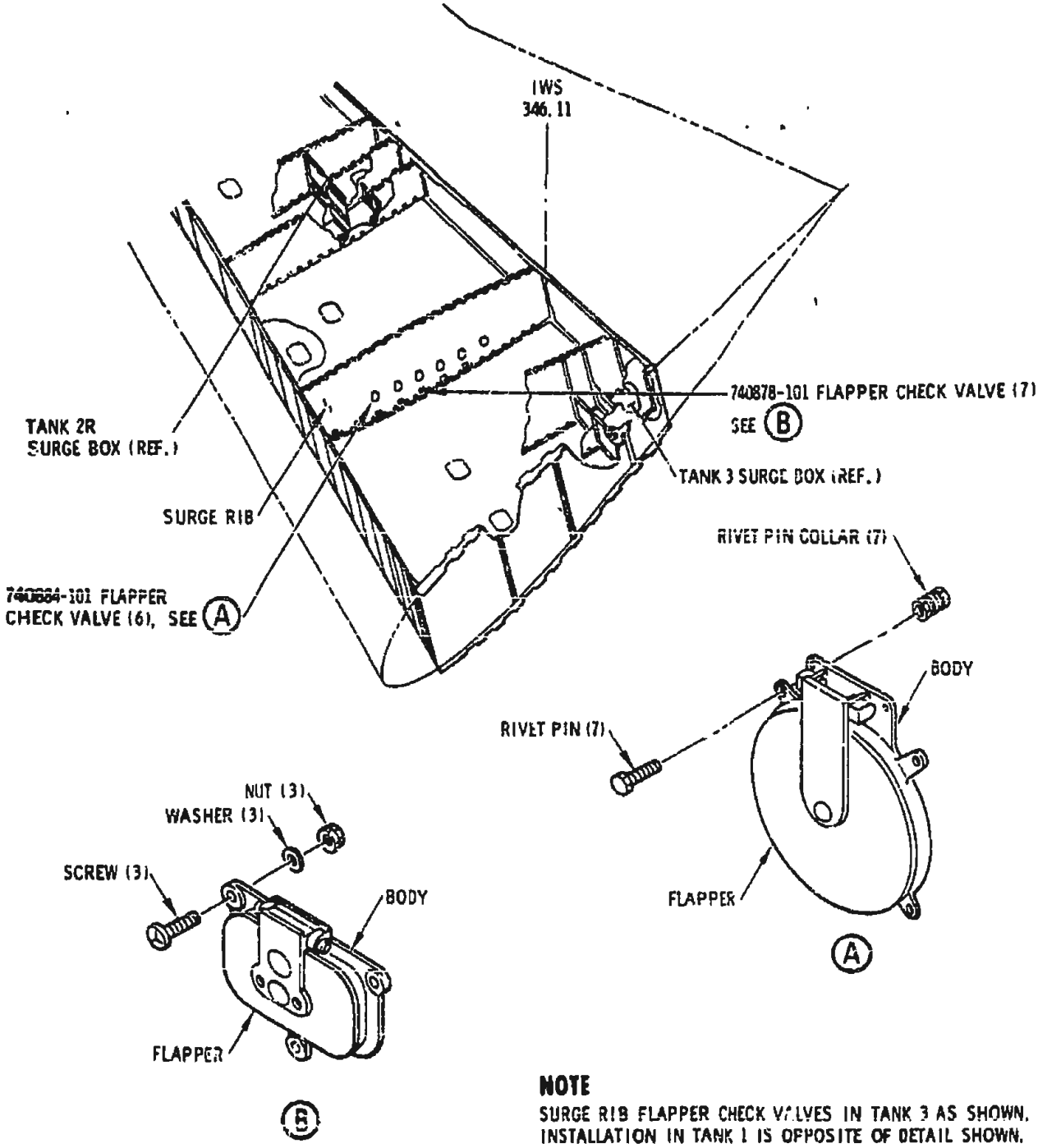
R (3) Apply fillet sealant around edges of the valve body. Apply thin coating of sealant over the fasteners.

(4) Check flapper for free movement and contact with all edges of the valve body seat. Be certain there is no sealant on the valve contact surfaces or hinge.

(5) Remove all tools and debris from work area.

R (6) Allow sufficient time for sealant to cure (Ref.
R 28-11-00) before fueling tank. Note accelerated cure time possible by applying heat to rework area before vacating tank.

(7) Reinstall tank cover plates (Ref. 57-33-01).



NOTE
SURGE RIB FLAPPER CHECK VALVES IN TANK 3 AS SHOWN. INSTALLATION IN TANK 1 IS OPPOSITE OF DETAIL SHOWN.

M1-0100-28-314

R Flapper Check Valves, Tank 1 and 3 Surge Ribs
R Removal and Installation
R Figure 401

R EFFECTIVITY: ALL
R
001B

FLAPPER CHECK VALVES, TANKS 2L AND 2R - REMOVAL AND INSTALLATION

1. General

Flapper check valves P/N 740878-101, -105, and -107, P/N 741263-101 and P/N 741264-105 are installed on tank 2L and 2R surge box walls. One P/N 741264-105 check valve is installed over the outlet port of each compound fuel ejector mounted on the forward wall of the surge box and is held in position by the compound ejector fasteners. Check valve P/N 741263-101 is attached to the IWS 529.40 rib just below the float actuated fuel transfer valve (Ref. 28-27-01). The remaining valves are installed in various locations on the wing ribs and partitions that enclose the surge box area.

NOTE: Malfunctioning flapper check valves can result in an excessive on-the-ground rate of fuel migration from the outboard to inboard tank section.

2. Referenced Procedures

28-11-00	Fuel Tanks - Maintenance Practices
28-22-00	Defueling - Maintenance Practices
57-33-01	Access Cover Plates and Doors - Removal and Installation

3. Removal/Installation

A. Removal

(1) Defuel tank 2L or 2R, as applicable (Ref. 28-22-00).

R WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF. 28-11-00).

(2) Purge tank (Ref. 28-11-00).

(3) Remove wing access cover plate 532BB/632BB for access to surge box (Ref. 57-33-01). Remove access cover plates 532CB/632CB for access to flapper check valve fastener parts on outside walls of surge box.

(4) Purge surge box area to lower fuel vapor concentration to specified safe LEL (Ref. 28-11-00).

(5) Using a sharpened phenolic or plastic scraper, remove fillet seal from edges of flapper check valve (Ref. Fig. 401).

(6) Remove valve body fasteners (screws, washers, spring where applicable, and nuts).

(7) Dislodge valve body from the surge box wall by breaking the faying surface bond between valve body and wall.

B. Installation

(1) Thoroughly clean old sealant from surge box wall faying surface.

(2) Apply thin coating of faying surface sealant (Ref. 28-11-00, Para. 5) to the valve body faying surface (Ref. Fig. 401). Mount valve on surge box wall and install fasteners (screw, washer, spring where applicable, and nut). Tighten fasteners equally and only as necessary to seat valve body on surge box wall. (Unequal tension or overtorqueing of fasteners could distort valve body and impair proper seating of flapper on valve body seat.)

NOTE: When installing flapper check valves P/N 740878-105 on wall of surge box, install spring-loaded fasteners as shown on Fig. 401. Adjust spring tension by tightening fastener nuts until nut bottoms out on unthreaded shank of attach screw.

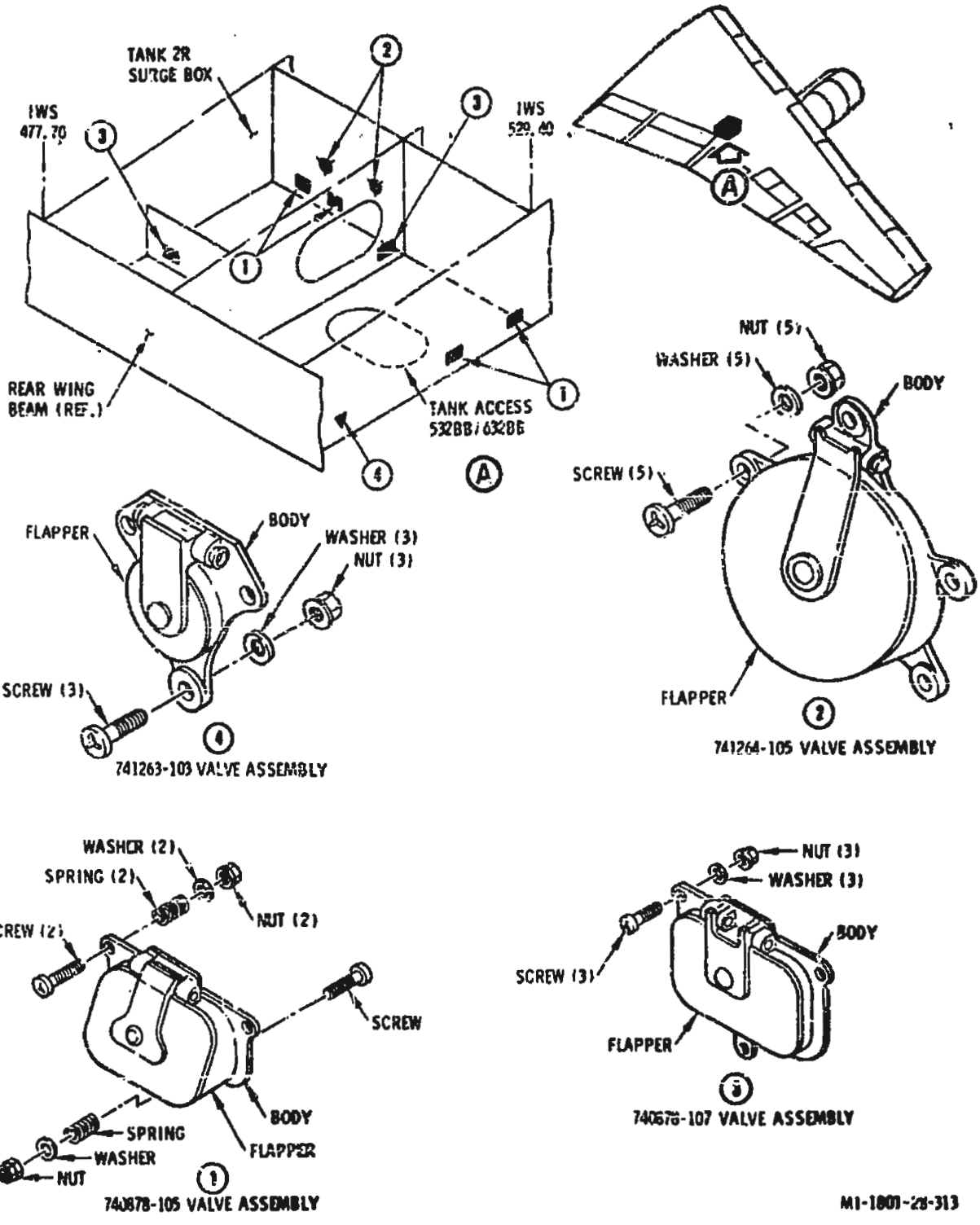
(3) Apply fillet sealant around the edges of the valve body. Apply thin coating of sealant over the fasteners. Do not apply sealant on springs of check valves having spring-loaded fasteners.

(4) Check flapper for free movement and contact with all edges of the valve body seat. Be certain there is no sealant on the valve contact surfaces or hinge.

(5) Remove all tools and debris from work area.

(6) Allow sufficient time for sealant to cure (Ref. 28-11-00) before fueling tank. Note accelerated cure time possible by applying heat to rework area before vacating tank.

(7) Reinstall tank cover plates (Ref. 57-33-01).



R Flapper Check Valves, Tank 2L and 2R - Removal and Installation
R Figure 401

R EFFECTIVITY: ALL
R
0018

TANK 1 AND 3 SCAVENGE VALVE - MAINTENANCE PRACTICES

1. General

The following procedure specifies tasks that must be performed if aircraft is dispatched with an inoperative tank 1 or 3 scavenge valve.

2. Deactivation

NOTE: This deactivation procedure applies only when an aircraft is to be dispatched in accordance with the MEL.

(1) Add placard to the FE/SO FUEL SYSTEM panel, zone 215. Placard must specify which scavenge valve is inoperative and valve position (open or closed).

(2) Make appropriate entry in aircraft log book.

TANK 1 AND 3 SCAVENGE VALVE - REMOVAL AND INSTALLATION

1. General

Tank 1 and 3 scavenge valves are mounted on the wing center section rear beam. Valve actuators are accessible from left and right main landing gear wheel wells. Valve body access is acquired by removing a wing center section access panel in the hydraulic service center and entering the center section aft (dry) bay.

2. Equipment and Materials

Preformed Packing (Ref. Fig. 402)

3. Referenced Procedures

6-40-00	Exterior Access Doors and Panels
6-50-00	Interior Access Doors and Removable Panels
12-11-00	Fuel Tank Replenishing - Servicing
24-00-00	Electrical Power System - Maintenance Practices
28-11-00	Fuel Tanks - Maintenance Practices
28-20-01	WIG-O-FLEX Couplings - Maintenance Practices
28-22-00	Defueling - Maintenance Practices
32-33-00	Main Landing Gear Inboard Door - Maintenance Practices

4. Removal/Installation

WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF. 28-11-00).

A. Actuator Removal

(1) On Flight Engineer/Second Officers (FE/SO) aft circuit breaker panel CB3, zone 215, open and tag SCAVENGE VALVE - TANK 1&1A (U5) or 3&3A (U6) and INBD BOOST PUMP - TANK 1 and 3 (U7 and U10) circuit breakers.

(2) If not open, left or right main landing gear inboard door (Ref. 32-33-00).

(3) Locate scavenge valve actuator on wing center section rear beam and disconnect electrical harness plug (Ref. Fig. 401).

(4) Remove actuator attach nuts and washers.

(5) Separate actuator from valve body.

(6) Remove valve shaft adapter and retain for installation.

B. Actuator Installation

(1) Verify that circuit breakers opened in Step 4A(1) are opened and tagged.

(2) Install adapter on actuator shaft using new retainer. Bend ends of retainer to secure retainer in position (Ref. Fig. 401).

(3) Using valve override lever, align actuator shaft adapter with valve shaft and mount actuator on valve body.

(4) Install actuator attach washers and nuts. Tighten nuts 15 to 20 lb in. higher than running torque.

(5) If valve is not open, rotate actuator override lever to OPEN position.

(6) Connect electrical harness plug and add lock-wire.

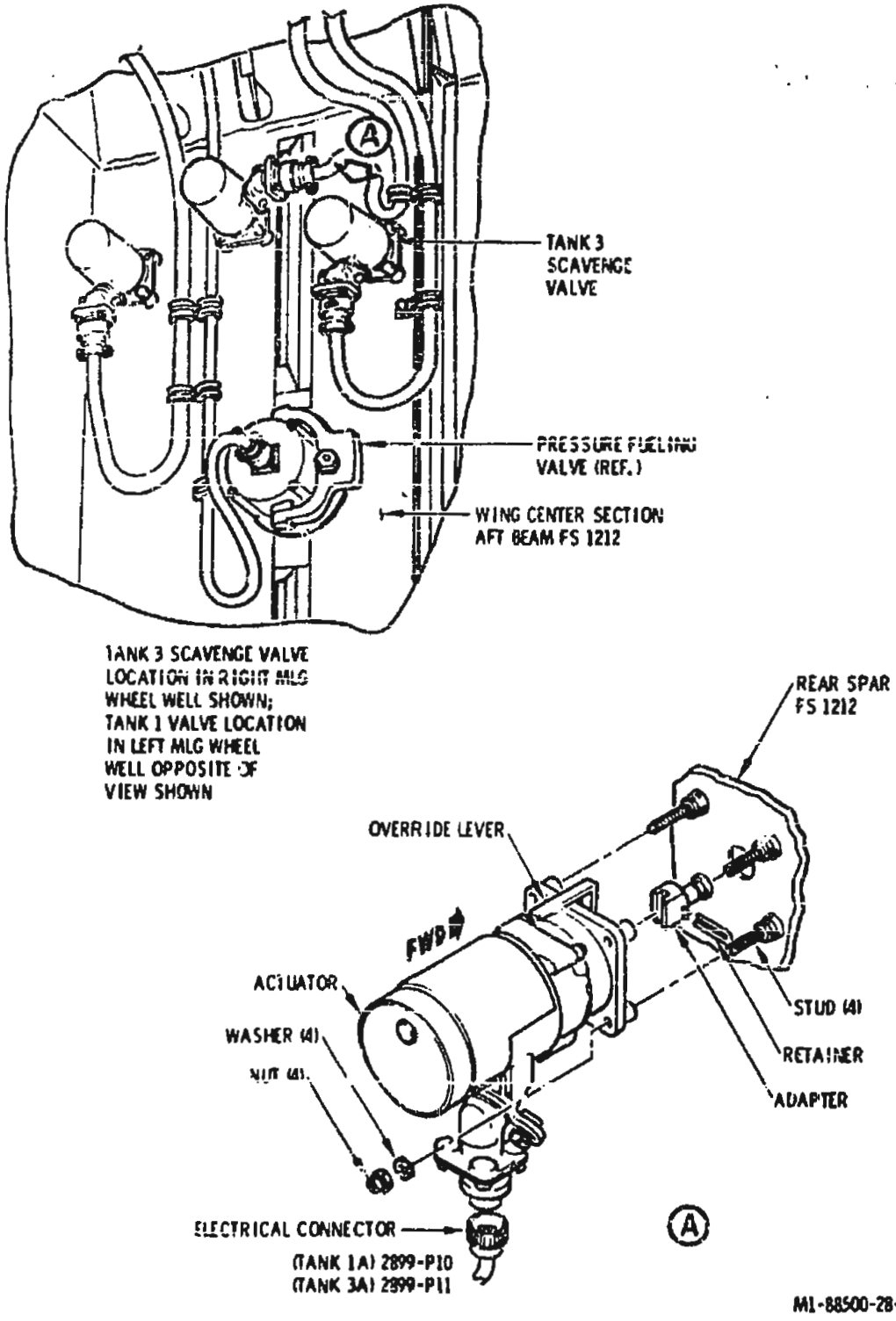
(7) Remove tags and close circuit breakers opened in Step 4A(1).

(8) Turn on electrical power (Ref. 24-00-00).

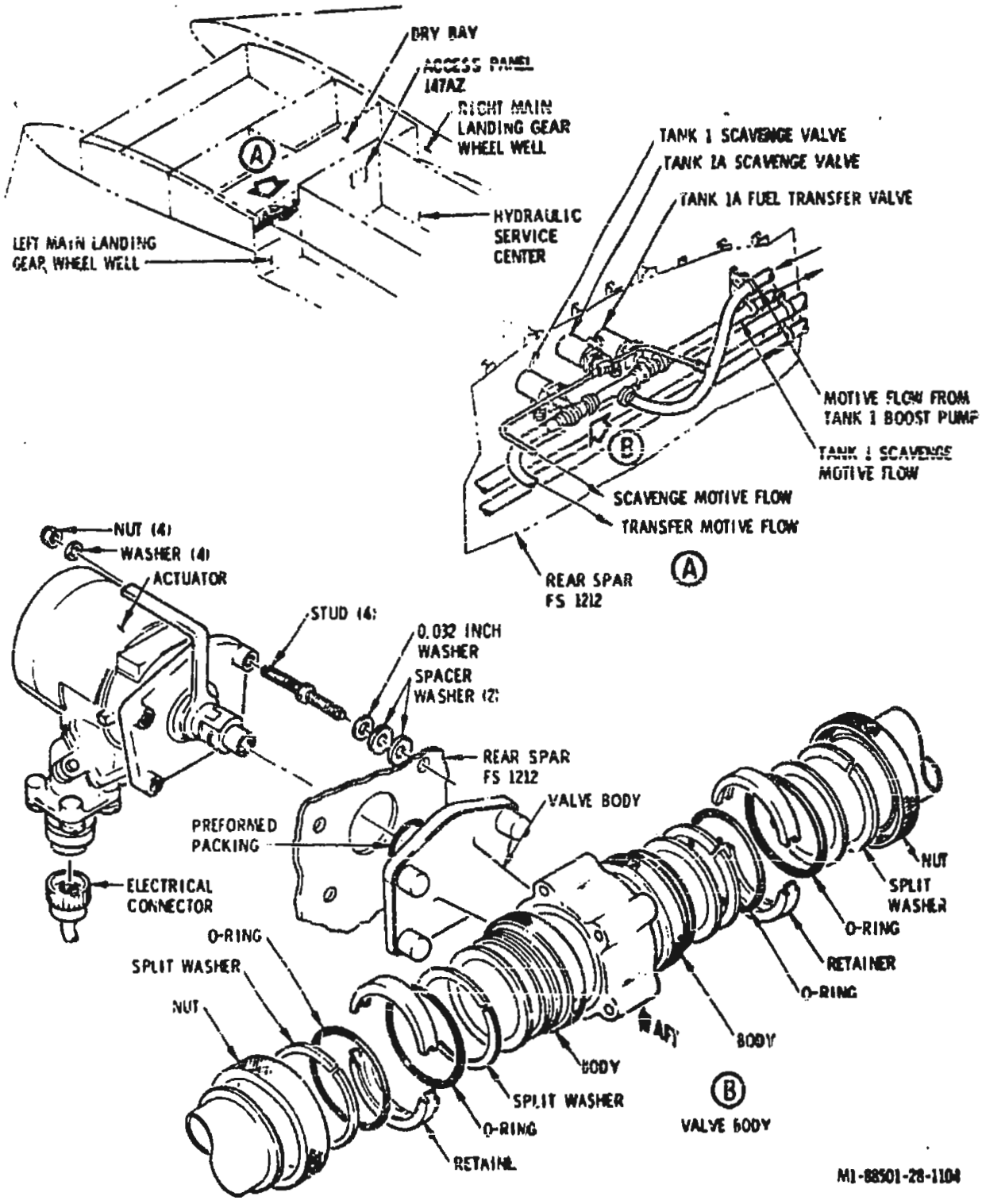
(9) On FUEL SYSTEM panel depress (latch) applicable 1A XFR or 3A XFR switch. Verify blue valve-in-transit light comes on (approximately one second) then goes out.

(10) In wheel well verify that actuator override lever has moved from OPEN to CLOSED position. (Applicable tank 1 or 3 fuel transfer valve should simultaneously open.)

(11) Depress (unlatch) 1A XFR or 3A XFR switch. Verify blue valve-in-transit light comes on (approximately one second) then goes out.



Tank 1 and 3 Scavenge Valve Actuator - Removal and Installation
Figure 401



Tank 1 and 3 Scavenge Valve Body - Removal and Installation
Figure 402

(12) Verify that scavenge valve opens and fuel transfer valve closes.

(13) Turn off electrical power (Ref. 24-00-00).

C. Valve Body Removal

(1) Defuel applicable tank 1 or 3 (Ref. 28-22-00).

(2) In left and right MLG wheel wells, verify that override lever on tank 1A (or 3A) fuel transfer valve actuator is in CLOSED position.

(3) Remove scavenge valve actuator (Ref. Para. 4A).

(4) Gain access to hydraulic service center through access door 147AB (Ref. 6-40-00).

(5) Remove access panel 147AZ on wing center section rear beam (Ref. 6-50-00).

(6) Set up air mover to ventilate center section aft dry bay area (Ref. 28-11-00).

NOTE: Wear an approved respirator while in the dry bay and have a second man stand by in hydraulic service center.

(7) Enter center section dry bay and disassemble fuel tube couplings (Ref. 28-20-01) at scavenge valve body (Ref. Fig. 402).

NOTE: Two spacer washers and a 0.032 inch anti-fretting washer is installed on each valve support stud between the stud hex head and center section. Retain these parts for reinstallation.

(8) Hold valve body while second man in wheel well removes four valve body attach studs.

(9) Remove valve body from aircraft.

(10) Continue to ventilate area.

D. Valve Body Installation

(1) Verify that air mover set up in Step 4C(6) is in place and operating.

NOTE: Wear an approved respirator while in the dry bay and have a second man stand by in the hydraulic service center.

(2) Insert new preformed packing in valve body flange (Ref. Fig. 402).

(3) Install one 0.032 inch anti-fretting washer and two spacer washers (AN960D416, or equivalent) on each of the four valve support studs.

(4) While man in dry bay holds valve body in its installed position, install four valve support studs. Tighten studs 85 to 95 lb inch higher than running torque.

(5) Reassemble fuel tube couplings at valve body (Ref. 28-20-01).

(6) Reinstall scavenge valve actuator (Ref. Para. 4B). If valve is closed, move actuator override lever to OPEN position.

(7) Refuel tank 1 or 3 (Ref. 12-11-00).

(8) At Flight Engineer/Second Officers FUEL SYSTEM panel, zone 215, depress (latch) applicable 1A XFR (or 3A XFR) switch. Verify that tank 1A (or 3A) fuel transfer valve opens and applicable tank 1 or 3 scavenge valve closes.

(9) Depress TANK 1 or 3 PUMPS switch to turn on boost pumps (Ref. 28-24-00).

(10) Check for leaks at valve couplings.

(11) Release (unlatch) 1A XFR or 3A XFR switch. Verify that scavenge valve opens and fuel transfer valve closes.

(12) Continue inspection for fuel leakage at valve body couplings.

(13) Turn off boost pumps.

(14) Remove all tools and equipment from dry bay area and reinstall access panel removed in Step 4C(3).

(15) Turn off electrical power (Ref. 24-00-00).

FUEL SCAVENGE PUMP (SMALL SINGLE NOZZLE), TANK 1, 2L, 2R, 3
REMOVAL AND INSTALLATION

1. General

R Six small, single nozzle, ejector type, fuel scavenge pumps are
R installed in tanks 1, 2L, 2R, and 3. Two pumps are mounted on
R the forward side of the pump box partition in the tank 1 and 3
R surge boxes, zones 531 and 631, and one on the outboard side of
R the fuel surge box in tank 2L and 2R, zones 532 and 632.

2. Referenced Procedures

28-11-00	Tanks - Maintenance Practices
28-20-01	Wiggins Connectors - Maintenance Practices
28-22-00	Defueling System - Maintenance Practices
57-33-01	Access Cover Plates and Doors - Removal and Installation

3. Removal/Installation

WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF. 28-11-00).

BEFORE ENTERING FUEL TANK, VERIFY THAT TANKS HAVE BEEN PURGED AND ADEQUATE FLOW OF VENTILATING AIR IS BEING SUPPLIED TO THE TANK (REF. 28-11-00).

A. Removal (Tank No. 1 or 3)

(1) Defuel tank (Ref. 28-22-00).

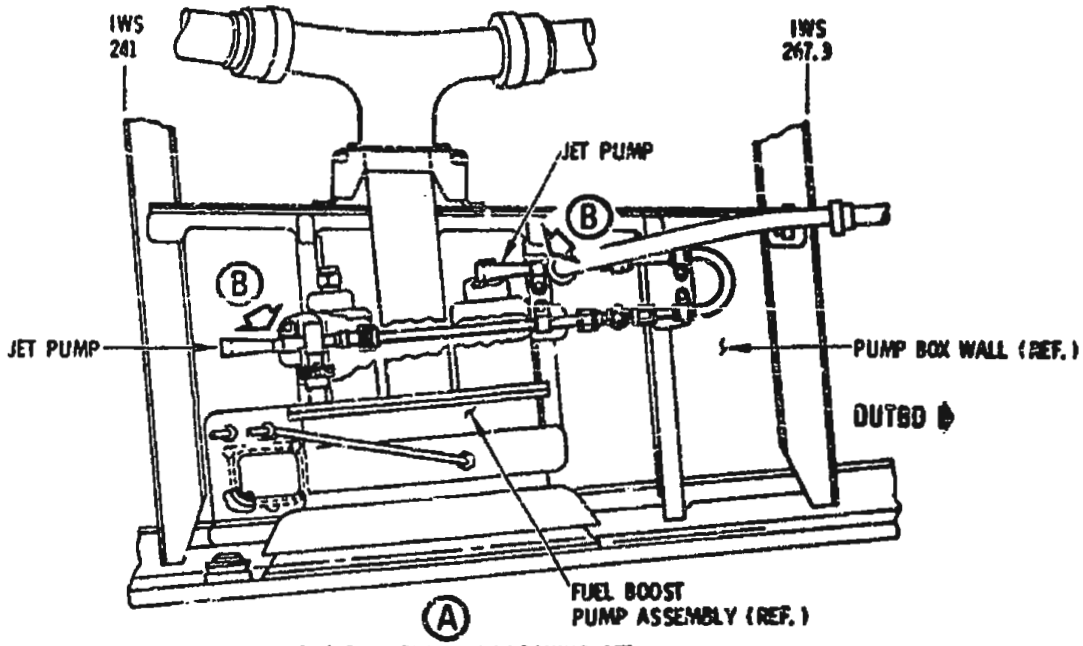
(2) Remove access cover 531AB or 631AB (Ref. 57-33-01).

(3) Purge and ventilate tank (Ref. 28-11-00).

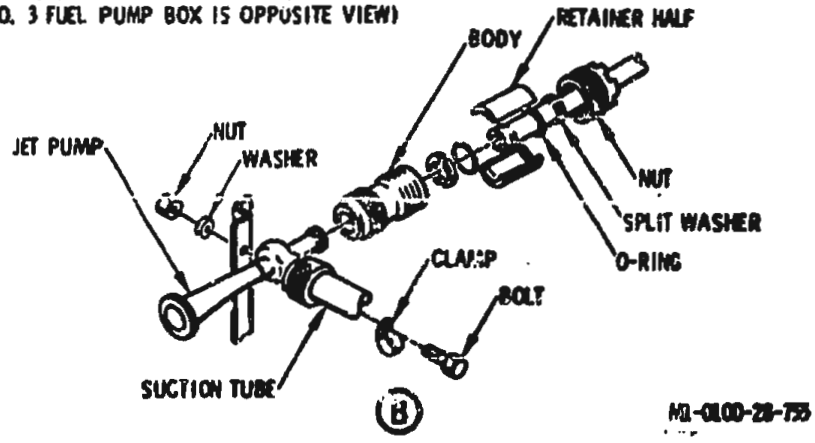
(4) Enter fuel tank and locate small jet pumps on forward side of the surge box partition (Ref. Fig. 401).

(5) Disassemble Wiggins connectors (Ref. 28-20-01) and remove fuel tubes.

(6) Remove pump attach bolt, washer, and nut.



NO. 1 FUEL PUMP BOX LOOKING AFT
(NO. 3 FUEL PUMP BOX IS OPPOSITE VIEW)



R Tank 1/3 Small Jet Pump - Removal and Installation
R Figure 401

R EFFECTIVITY: ALL
R
001B

(7) Remove clamp from pump. Save clamp for installation.

B. Removal (Tank No. 2L or 2R)

(1) Defuel tank (Ref. 28-22-00).

(2) Remove access covers 532CB or 632CB (Ref. 57-33-01).

(3) Purge and ventilate tank (Ref. 28-11-00).

(4) Enter tank and locate small jet pump on outboard side of surge box rib IWS 529 (Ref. Fig. 402).

(5) Disassemble Wiggins connectors (Ref. 28-20-01) and remove fuel tubes.

R (6) Remove pump attach bolt, washer, and nut.

R (7) Remove clamp from pump. Save clamp for installation.

C. Installation (Tank No. 1 or 3, 2L or 2R)

(1) Install clamp on pump.

(2) Mount pump in position (Ref. Fig. 401, 402).

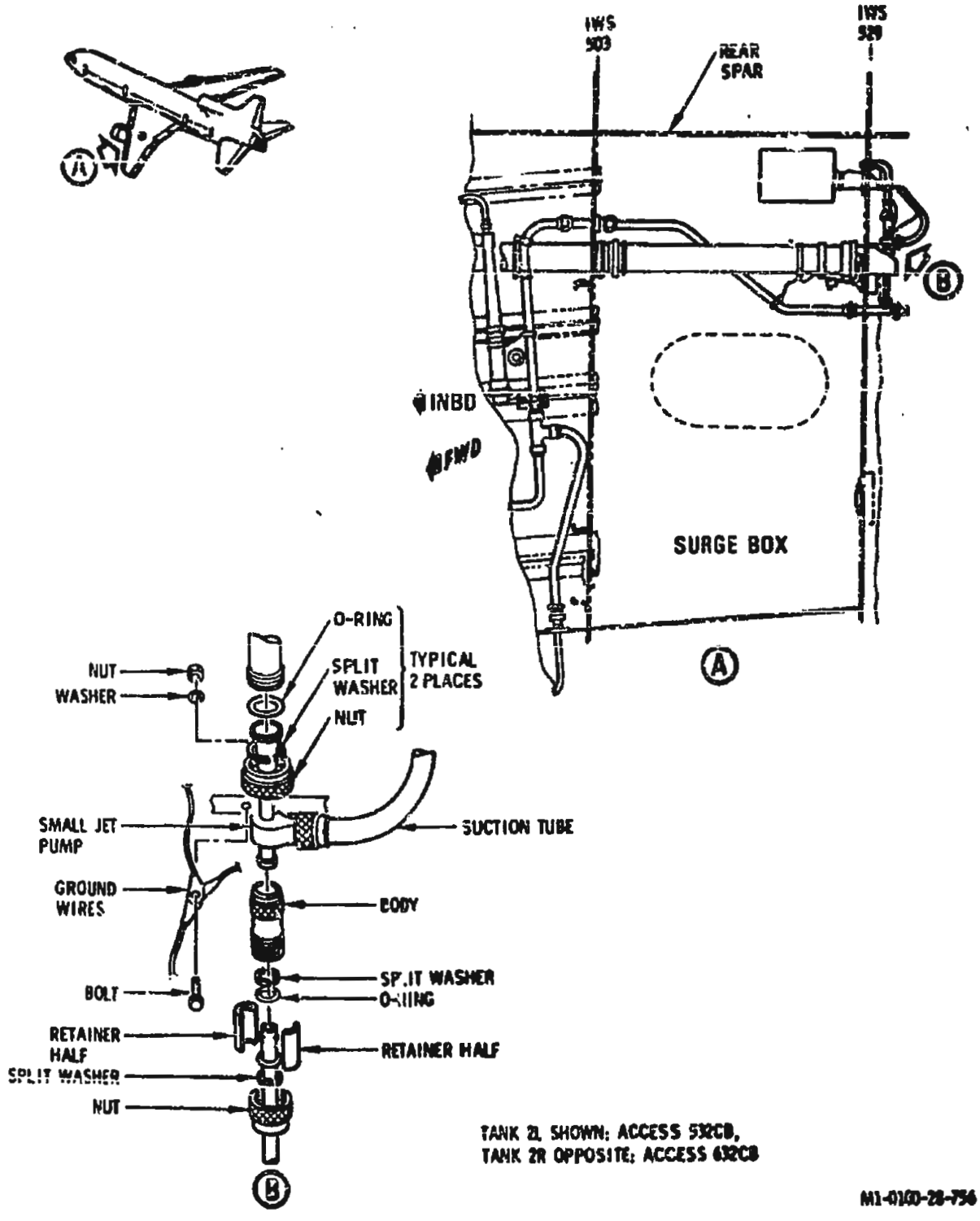
(3) In tank No. 1 or 3 install bolt, washer, and nut.

(4) In tank No. 2L or 2R pick up three ground jumpers when installing bolt, washer, and nut.

(5) In tank No. 2L or 2R seal mounting screw (Ref. 28-11-00).

(6) Using new O-rings in fuel tube connectors, connect tubes to pump inlet ports. Hand-tighten connector nut until ferrule bottoms against connector body. Install lock-wire between ferrule and nut, with lock-wire pigtail bent back against ferrule or nut (Ref. 28-20-01).

(7) Clear tank area of all tools and materials and reinstall tank access covers (Ref. 57-33-01).



R Tank 2L/2R Small Jet pumps - Removal and Installation
R Figure 402

R EFFECTIVITY: ALL
R
001B

R FUEL SCAVENGE PUMP (LARGE SINGLE NOZZLE), TANK 1, 2L, 2R, 3
R REMOVAL AND INSTALLATION

R 1. General

R Ten large, single nozzle, ejector type fuel scavenge pumps are
R installed in tanks 1, 2L, 2R, and 3. Four pumps are installed
R in the tank 1 and 3 fuel pump boxes, zones 531 and 631, and one
R in each tank 2L and 2R fuel boost pump box, zones 532 and 632.

R 2. Referenced Procedures

R	28-11-00	Tanks - Maintenance Practices
R	28-20-01	Wiggins Connectors - Maintenance Practices
R	28-22-00	Defueling System - Maintenance Practices
R	57-33-01	Access Cover Plates and Doors - Removal and Installation

R 3. Removal/Installation

R WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL
R SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY
R GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES.
R OBSERVE ALL SAFETY REGULATIONS (REF. 28-11-00).

R BEFORE ENTERING FUEL TANK, VERIFY THAT TANKS HAVE BEEN
R PURGED AND ADEQUATE FLOW OF VENTILATING AIR IS BEING
R SUPPLIED TO THE TANK (REF. 28-11-00).

R A. Removal (Tank No. 1 or 3)

R (1) Defuel tank (Ref. 28-22-00).

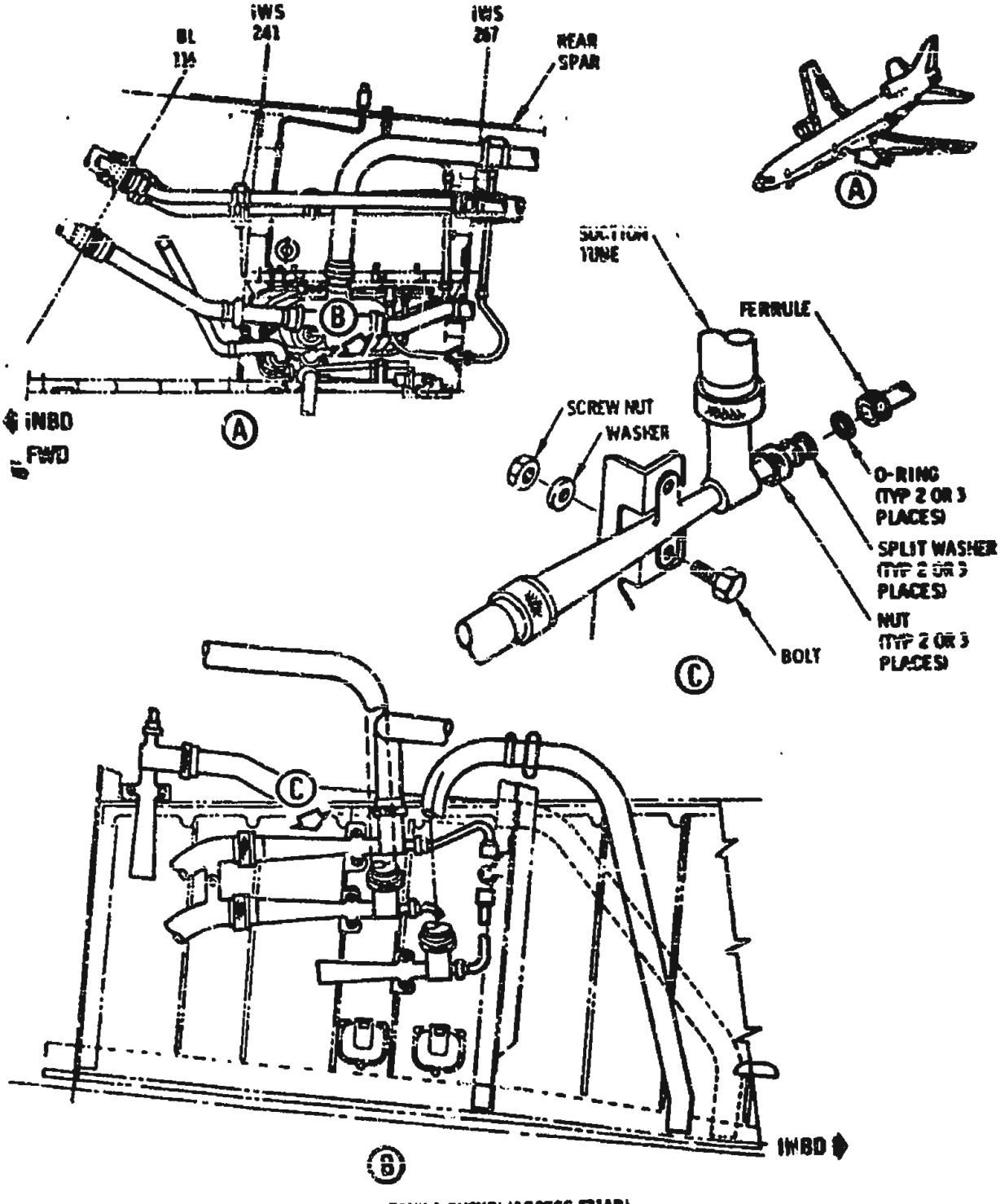
R (2) Remove access cover 531AB or 631AB (Ref. 57-33-01).

R (3) Purge and ventilate tank (Ref. 28-11-00).

R (4) Enter fuel tank and locate large jet pumps on forward
R partition of fuel boost pump box (Ref. Fig. 401).

R (5) Disassemble two or three Wiggins connectors (Ref.
R 28-20-01) and remove fuel tubes.

R (6) Remove pump attach bolts, washers, and nuts.



TANK 1 SHOWN (ACCESS 531AB)
TANK 3 OPPOSITE (ACCESS 631AB)

M1-35100-28-732

R R Tank 1/3 Large Jet Pump - Removal and Installation
Figure 401

R EFFECTIVITY: ALL
R R
001B

R B. Removal (Tank No. 2L or 2R)

R (1) Defuel tank (Ref. 28-22-00).

R (2) Remove access covers 53288 or 63288 (Ref. 57-33-01).

R (3) Purge and ventilate fuel tanks (Ref. 28-11-00).

R (4) Enter tank and locate large jet pump on aft bulkhead of
R the pump box (Ref. Fig. 402).

R (5) Disassemble three Wiggins connectors (Ref. 28-20-01)
R and remove fuel tubes.

R (6) Remove pump attach bolts, washers, and nuts.

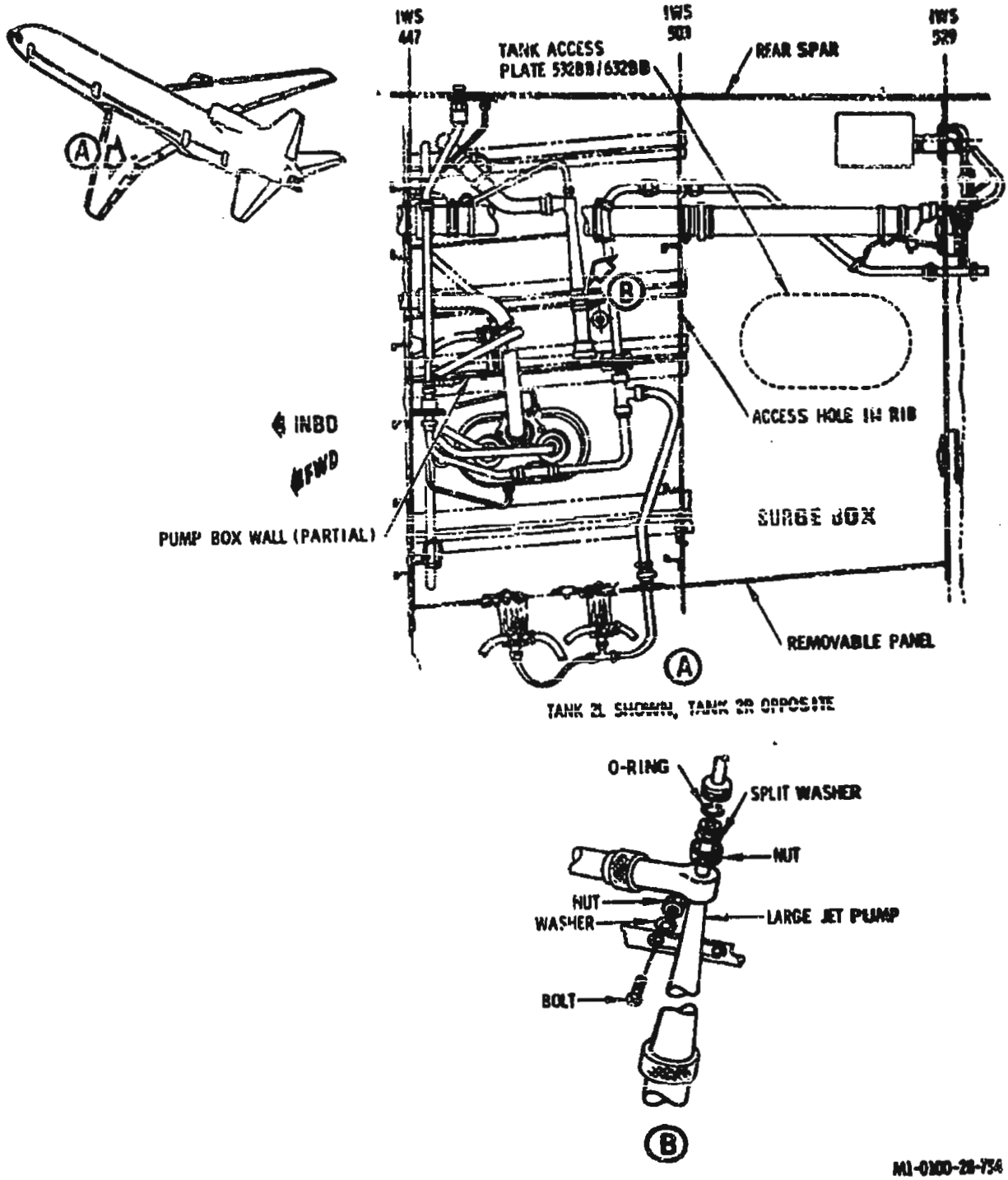
R C. Installation (Tank No. 1 or 3, 2L or 2R)

R (1) Mount jet pump in position (Ref. Fig. 401 and 402).

R (2) Install bolts, washers, and nuts.

R (3) Using new O-rings in fuel tube connectors, connect
R tubes to pump inlet ports. Hand-tighten connector nut
R until ferrule bottoms against connector body. Install
R lock-wire between ferrule and nut, with lock-wire
R pigtail bent back against ferrule or nut (Ref.
R 28-20-01).

R (4) Clear tank area of all tools and materials and
R reinstall tank access covers (Ref. 57-33-01).



TANK 2L SHOWN, TANK 2R OPPOSITE

R Tank 2L/2R Large Jet Pump - Removal and Installation
R Figure 402

R EFFECTIVITY: ALL
R
0018

FUEL SCAVENGE PUMP (SMALL, SINGLE NOZZLE), TANK 1A/3A REMOVAL AND INSTALLATION

1. General

One small single nozzle fuel scavenge jet pump is mounted on the FS 1163 wing center section beam in Tank 1A and 3A.

2. Equipment and Materials

O-Ring packing

3. Referenced Procedures

6-50-00	Interior Access Doors and Removable Panels
12-11-11	Pressure Fueling - Servicing
24-00-00	Electrical Power System - Maintenance Practices
28-11-00	Fuel Tanks - Maintenance Practices
28-20-01	WIG-O-FLEX Couplings - Maintenance Practices
28-22-00	Defueling - Maintenance Practices
32-63-00	Air/Ground Sensing - Maintenance Practices

4. Removal/Installation

WARNING: ATTACH MAINTENANCE-IN-PROGRESS TAGS TO FE/SO FUEL SYSTEM AND FUELING/DEFUELING CONTROL PANELS.

OBSERVE ALL FUEL SYSTEM WARNINGS AND PRECAUTIONS (REF. 28-11-00).

A. Removal

(1) Defuel tanks 1A or 3A (Ref. 28-22-00).

(2) On FE/SO FUEL SYSTEM panel release TANK 1 or 3 PUMPS switchlights.

Release 1A XFR or 3A XFR switchlights.

(3) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag following circuit breakers:

INBD BOOST PUMPS (U7, U10)

OUTBD BOOST PUMPS (U13, U14)

SCAVENGE TANK 1A & 3A (U16)

SCAVENGE VALVE TANK 1 & 1A (U5)

SCAVENGE VALVE TANK 3 & 3A (U6)

(4) In left or right main wheel wells verify tank 1A or 3A scavenge valve is closed. Verify tank 1A or 3A transfer valve is closed.

(5) Open access doors 142DB, 142GB, and 147AB.

(6) Remove access panels 141AZ and 147AZ (Ref. 6-50-00).

R WARNING: PURGING AND VENTILATING OF FUEL TANK IS REQUIRED WHEN PERSONNEL MUST ENTER TANK.

(7) Remove access panels 141.3AZ and 141.7AZ for tank 1A (141.4AZ and 141.8AZ for tank 3A), purge and ventilate tank (Ref. 28-11-00).

(8) Enter tank and locate small jet pump (Ref. Fig. 401) at inboard end of FS 1163 bulkhead.

(9) Remove Wiggins couplings (Ref. 28-20-01).

(10) Remove screw from clamp and remove clamp from jet pump. Save clamp for installation.

(11) Remove and discard O-rings.

B. Installation

(1) Verify that circuit breakers opened in Step 4A(3) are open and tagged.

(2) Verify tank ventilation is installed and is operating as in Step 4A(7).

(3) Place clamp around throat of jet pump.

(4) Hold jet pump in position (Ref. Fig. 401).

(5) Pick up ground jumper and clamp with screw and fasten pump in place.

(6) Install Wiggins couplings (Ref. 28-20-01).

(7) Remove ventilating equipment and close access panels removed in Step 4A(6).

(8) Close circuit breakers opened in Step 4A(5).

(9) Turn on electrical power (Ref. 24-00-00).

(10) Fill tank 1A or 3A (Ref. 12-11-11). Check for leaks around access panels.

(11) On FE/SO FUEL SYSTEM panel depress TANK 1A or TANK 3A switchlights. Verify QTY light comes on. Note fuel quantity in tank 1A or 3A.

CR CR R CAUTION: IF BOOST PUMPT CIRCUIT BREAKER TRIPS, DO NOT RESET UNTIL IT IS VERIFIED THAT CIRCUIT BREAKER TRIP IS NOT CAUSED BY MALFUNCTION IN BOOST PUMP ASSEMBLY.

(12) Depress both TANK 1 or 3 PUMPS switchlights. Verify flowbars come on and LOW lights are off.

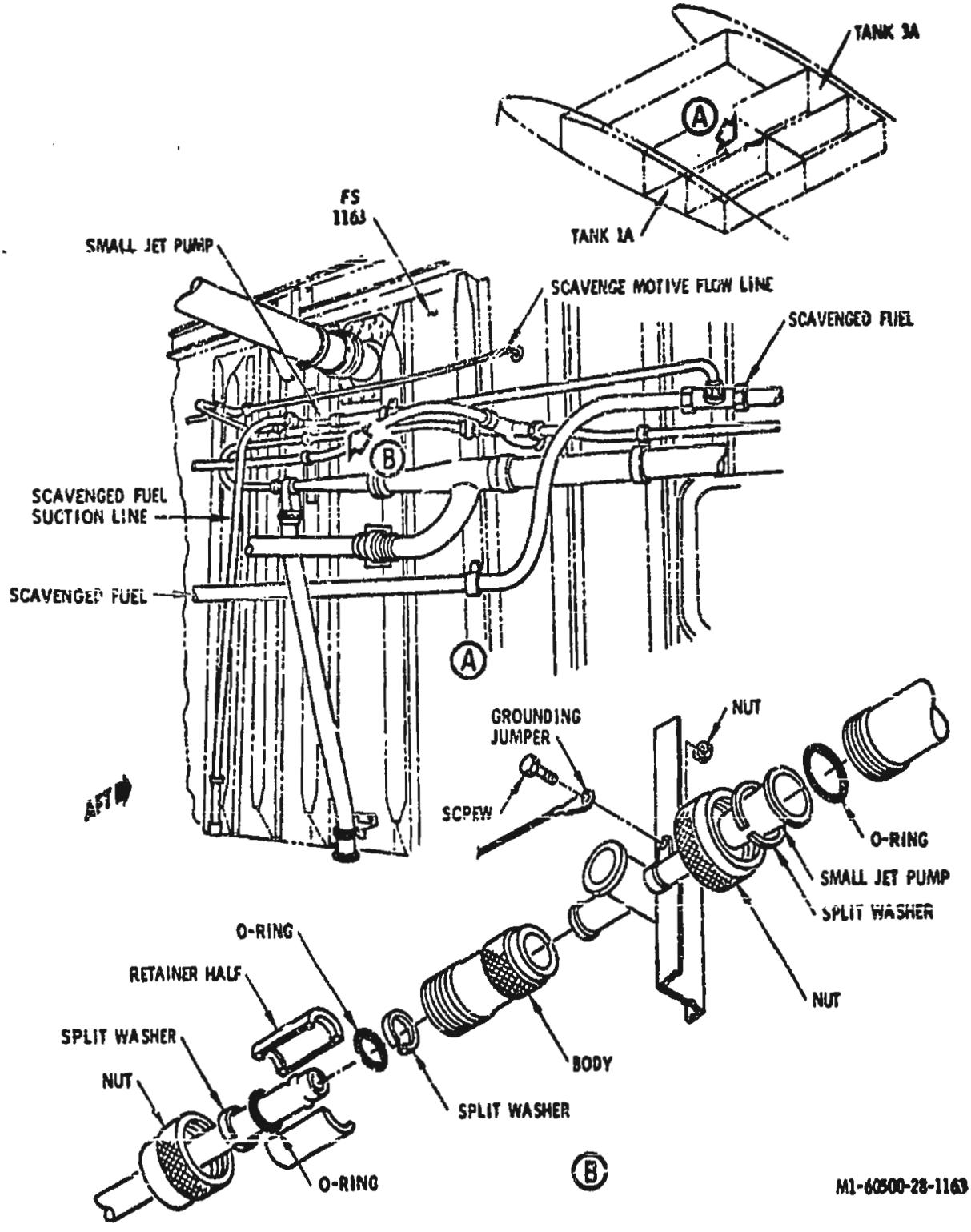
(13) Simulate airborne condition for both main landing gear (Ref. 32-63-00). In left or right main wheel wells verify tank 1A or 3A scavenge valve is open.

(14) Verify fuel quantity in tank 1A or 3A is reducing at approximately 90 pounds per minute.

CAUTION: VERIFY ZIPPER DOOR IN AIRFLOW BARRIER IS CLOSED.

(15) Close access doors opened in Step 4A(5).

(16) Turn off electrical power.



Jet Pump - Removal and Installation
Figure 401

FUEL SCAVENGE PUMP (COMPOUND JET EJECTOR), TANK 2L and 2R REMOVAL AND INSTALLATION

1. General

Ten compound, jet multiple nozzle, ejector type fuel scavenge pumps are installed in fuel tanks No. 2L and 2R. Two pumps are mounted on the forward partition of the surge boxes in zones 532 and 632, and one on the aft partition of the fuel boost pump box, in each of these areas. The remaining four pumps are attached to the outboard surfaces of the outer wing station (OWS) 126.80 wing ribs, two in zone 533 and two in zone 633.

2. Equipment and Materials

Cleaner, LAC Spec C-32-337 or LCM32-1087, or equivalent

Cotton Rags, Fed Spec DDD-R-30, or equivalent

O-ring packing (Ref. Fig. 401)

CR Sealant, PR 1422 B 1/2, PR 1435, PR 1826 B 1/4, or equivalent

3. Referenced Procedures

12-11-00	Servicing - Maintenance Practices
28-11-00	Tanks - Maintenance Practices
28-20-01	Wiggins Connectors - Maintenance Practices
28-22-00	Defueling System - Maintenance Practices
57-33-01	Access Cover Plates and Doors - Removal and Installation

4. Removal/Installation

WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF. 28-11-00).

BEFORE ENTERING FUEL TANK, VERIFY THAT TANKS HAVE BEEN PURGED AND ADEQUATE FLOW OF VENTILATING AIR IS BEING SUPPLIED TO THE TANK (REF. 28-11-00).

A. Removal (Fuel Ejector Pumps in the Inboard Sections of Tank No. 2L or 2R)

(1) Defuel the aircraft (Ref. 28-22-00).

(2) Remove access cover 532BB or 632BB (Ref. 57-33-01).

(3) Purge fuel tank (Ref. 28-11-00).

(4) Enter fuel tank and locate two compound fuel ejector pumps on forward partition of the surge box and one on the aft partition of the fuel boost pump box.

(5) If a jet ejector pump on the surge box partition is being removed, disassemble tube connectors and remove fuel pressure inlet tube between inlet ports of the two jet ejector pumps.

(6) Disconnect fuel tubes at pump being removed.

(7) Remove pump attach bolts, washers, and nuts. (On surge box mounted pump, remove only bolts passing through holes in mounting flanges of pump).

(8) Dislodge pump from faying surface sealant and remove from tank.

B. Removal (Fuel Ejector Pumps in the Outboard Section of Tank No. 2L or 2R)

(1) Defuel tank (Ref. 28-22-00).

(2) Remove access covers 532FB and 533AB or 632FB and 633AB (Ref. 57-33-01).

(3) Purge fuel tank (Ref. 28-11-00).

(4) Enter outboard section of fuel tank 2L or 2R and locate fuel ejector pumps on outboard surface of the OWS 126.80 wing rib. Enter the inboard section of fuel tank 2L or 2R for access to the pump attach bolt nuts and washers.

(5) Disassemble tube connectors and remove fuel pressure inlet tube between inlet ports of the two ejector pumps.

(6) Disconnect scavenge fuel tubes at pump being removed.

(7) Remove pump attach bolts, washers, and nuts.

CR (8) Dislodge pump carefully if faying surface sealant has
CR previously been used and removed from tank. (Take care not to dislodge elbow of tube connected to tank low-level fuel transfer manifold from its sealed bond on the inboard side of the OWS 126.80 wing rib).

C. Installation (Fuel Ejector Pumps in Inboard Section of Tank No. 2L or 2R)

(1) Remove old sealant and clean faying surface area on surge box partition, using clean rag dampened with cleaner. Wipe dry using clean rag.

CR (2) DELETED.

CR (3) Mount pump on surge box partition. Cover bolt heads
CR and nuts with sealant and install sealant around the
CR flange of the pump after installation. Allow sealant to cure for specified times and temperatures before refueling (Ref. 28-11-00).

(4) Using new O-rings in fuel tube connectors, connect tubes to pump inlet ports. Hand-tighten connector nut until ferrule bottoms against connector body. Install lock-wire between ferrule and nut, with lock-wire pigtail bent back against ferrule or nut (Ref. 28-20-01).

(5) (Applicable only to jet ejector pumps on surge box partition). Install tube between pressure inlet ports of two pumps. Assemble and tighten tube connectors as in Step 4C(4).

CR (6) Clear tank area of all tools, materials, and dislodge
CR sealant and paint chips; reinstall tank access covers
CR (Ref. 57-33-01).

D. Installation (Fuel Ejector Pump in Outboard Section of Tank No. 2L or 2R)

(1) Remove old sealant and clean faying surface area on OWS 126.80 wing rib, using clean rag dampened with cleaner. Wipe dry using clean rag.

CR (2) DELETED.

CR CAUTION: DO NOT APPLY SEALANT TO FAYING SURFACE PRIOR TO
CR INSTALLING PUMP AS SEALANT MAKES IT DIFFICULT TO
CR REMOVE PUMP FOR MAINTENANCE WITHOUT CAUSING DAMAGE
CR TO PUMP FLANGE.

CR CR CR (3) Mount pump on wing rib. Cover attach bolts and nuts with sealant; install sealant around the flange of the pump after installation. Allow sealant to cure for specified times and temperatures before refueling (Ref. 28-11-00).

(4) Using new O-rings in scavange fuel tube connectors, connect tubes to pump inlet ports. Hand-tighten connector nut until ferrule bottoms against connector body. Install lock-wire between ferrule and nut, with lock-wire pigtail bent back against ferrule or nut (Ref. 28-20-01).

(5) Install tube between pressure inlet ports of the two pumps. Assemble and tighten tube connectors as in Step 4D(4).

CR CR CR (6) Clear tank area of all tools, materials, and dislodge sealant and paint chips; reinstall tank access covers (Ref. 57-33-01).

FUEL SCAVENGE PUMP (COMPOUND JET EJECTOR), TANK 2L AND 2R CLEANING AND PAINTING

1. Equipment and Materials

Pre-formed packing MS29513-033 or equivalent

C Grease, Fluorosilicone, Dow Corning FS-12921, or equivalent

C Sealant, PR 1435, or equivalent

2. Referenced Procedures

28-11-12 Fuel Scavenge Pump (Compound Jet Ejector), Tank 2L and 2R - Removal and Installation

3. Cleaning and Painting

A. Cleaning

C (1) Remove jet ejector pump (Ref. 28-11-12) (Optional).

C (2) Remove ejector pump cover leaving the jet pump housing
C installed on the aircraft (Ref. Fig. 701).

NOTE: Use care when removing screws due to their softness and the use of sealant under them.

CAUTION: DO NOT ENLARGE ORIFICES OR PUMP PERFORMANCE WILL BE AFFECTED.

(3) Remove all foreign material from jet orifices in body of jet pump.

CR NOTE: Jet orifice diameter is 0.06 inch.

(4) Carefully examine all passageways in pump and remove any tank sealant, or foreign material that is found.

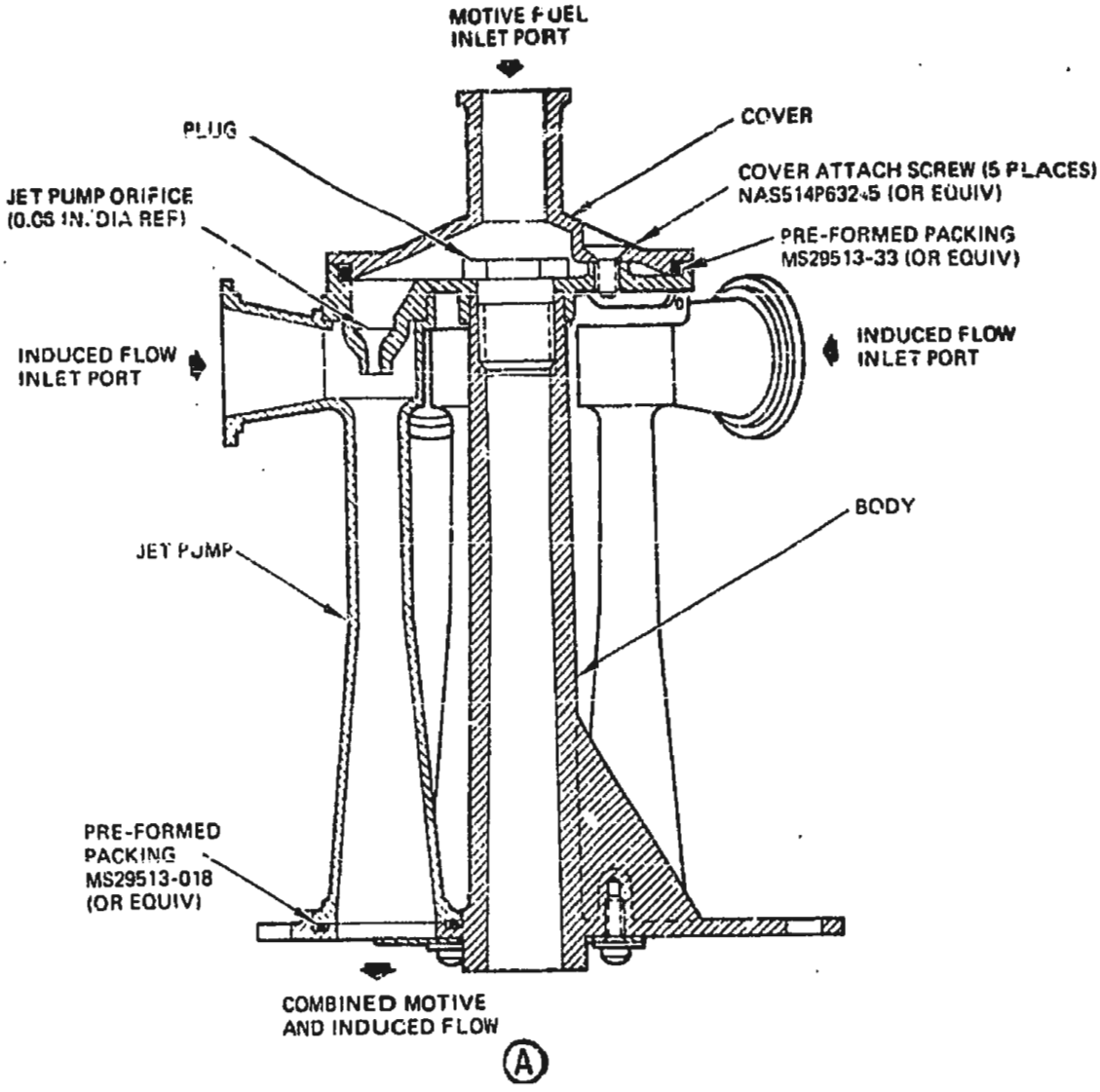
(5) Remove all sealant from cover and screw attachment areas of pump body.

(6) Lubricate and install new packing on cover.

CAUTION: DO NOT OVER TIGHTEN SCREWS.

(7) Install cover using wet installed screws (torque value 7-9 lb-in.).

C (8) Reinstall jet ejector pump (Ref. 28-11-12), if removed.



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CR Compound Fuel Scavenge Jet Ejector Pump
CR Figure 701

R EFFECTIVITY: ALL
R
001B

FUEL SCAVENGE PUMP (COMPOUND JET EJECTOR), TANK 1A AND 3A REMOVAL AND INSTALLATION

1. General

One compound, multiple nozzle, ejector type, fuel scavenge pump is mounted in tank 1A and 3A on the BL-0 wing center section tank separation rib.

2. Equipment and Materials

0-Ring packing (Ref. Fig. 401)

CR Sealant, PR 1422 B 1/2, PR 1435, PR 1826 B 1/4, or equivalent

3. Referenced Procedures

6-50-00	Interior Access Doors and Removable Panels
12-11-11	Pressure Fueling - Servicing
24-00-00	Electrical Power System - Maintenance Practices
28-11-00	Fuel Tanks - Maintenance Practices
28-20-01	WIG-O-FLEX Couplings - Maintenance Practices
28-22-00	Defueling - Maintenance Practices
32-63-00	Air/Ground Sensing - Maintenance Practice

4. Removal/Installation

WARNING: ATTACH MAINTENANCE-IN-PROGRESS TAGS TO FE/SO FUEL SYSTEM AND FUELING/DEFUELING CONTROL PANELS.

OBSERVE ALL FUEL SYSTEM WARNINGS AND PRECAUTIONS (REF. 28-11-00).

A. Removal

(1) Defuel tanks 1A or 3A (Ref. 28-22-00).

(2) On FE/SO FUEL SYSTEM panel release TANK 1 or 3 PUMPS switchlights.

Release 1A XFR or 3A XFR switchlights.

(3) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag following circuit breakers:

INBD BOOST PUMPS (U7, U10)

OUTBD BOOST PUMPS (U13, U14)

SCAVENGE TANK 1A & 3A (U16)

SCAVENGE VALVE TANK 1 & 1A (U5)

SCAVENGE VALVE TANK 3 & 3A (U6)

(4) In left or right main wheel wells verify tank 1A or 3A scavenge valve is closed. Verify tank 1A or 3A transfer valve is closed.

(5) Open access doors 142DB, 142GB, and 147AB.

(6) Remove access panels 141AZ and 147AZ (Ref. 6-50-00).

WARNING: PURGING AND VENTILATING OF FUEL TANK IS REQUIRED WHEN PERSONNEL MUST ENTER TANK.

(7) Remove access panels 141.3AZ and 141.7AZ for tank 1A (141.4AZ and 141.8AZ for tank 3A), purge and ventilate tank (Ref. 28-11-00).

(8) Enter tank and locate compound jet pump (Ref. Fig. 401).

(9) Remove six Wiggins couplings (Ref. 28-20-01).

(10) Remove five screws and nuts from pump and elbow.

(11) Remove pump from bracket.

(12) Remove and discard O-rings.

B. Installation

(1) Verify that circuit breakers opened in Step 4A(3) are open and tagged.

(2) Verify tank ventilation is installed and is operating as in Step 4A(7).

(3) Using sharpened plastic scraper remove sealant from bracket where pump is to be installed.

CR CR CR CR CAUTION: DO NOT APPLY SEALANT UNDER PUMP PRIOR TO INSTALLING PUMP AS SEALANT MAKES IT DIFFICULT TO REMOVE PUMP FOR MAINTENANCE WITHOUT CAUSING DAMAGE.

CR CR CR CR CR (4) Install pump, screws and nuts (Ref. 28-11-00). Cover attach screws and nuts with sealant; install sealant around the flange of the pump after installation. Allow sealant to cure for specified items and temperatures before refueling (Ref. 28-11-00).

NOTE: If elbow has broken loose it must also be wet installed.

(5) Install Wiggins couplings (Ref. 28-20-01).

(6) Close access panels removed in Step 4A(7).

(7) Close circuit breakers opened in Step 4A(3).

(8) Turn on electrical power (Ref. 24-00-00).

(9) Fill tank 1A or 3A (Ref. 12-11-11). Check for leaks around access panels.

(10) On FE/SO FUEL SYSTEM panel depress TANK 1A or TANK 3A switchlights. Verify QTY light comes on. Note fuel quantity in tank 1A or 3A.

C C CAUTION: IF BOOST PUMP CIRCUIT BREAKER TRIPS, DO NOT RESET UNTIL IT IS VERIFIED THAT CIRCUIT BREAKER TRIP IS NOT CAUSED BY MALFUNCTION IN BOOST PUMP ASSEMBLY.

(11) Depress both TANK 1 or 3 PUMPS switchlights. Verify flowbars come on and LOW lights go off.

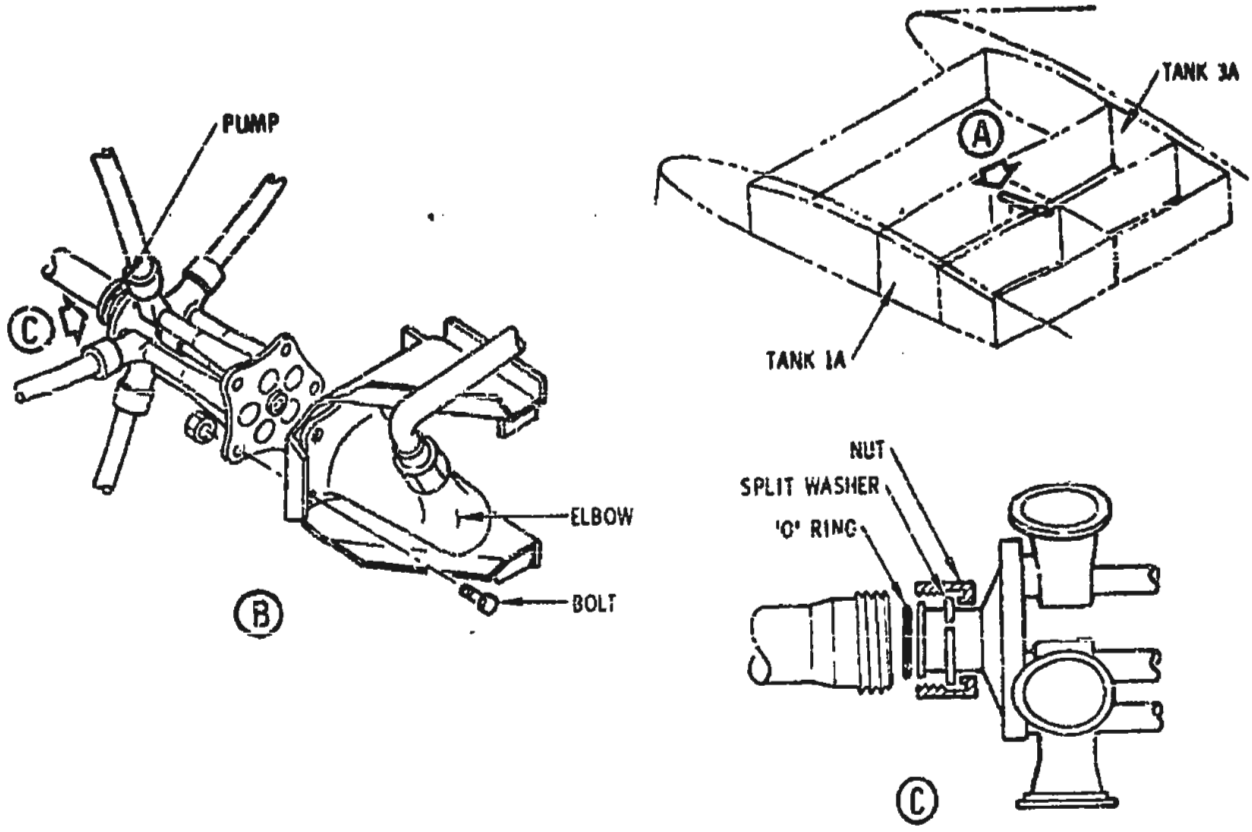
(12) Simulate airborne condition for both main landing gear (Ref. 32-63-00). In left or right main wheel wells verify tank 1A or 3A scavenge valve is open.

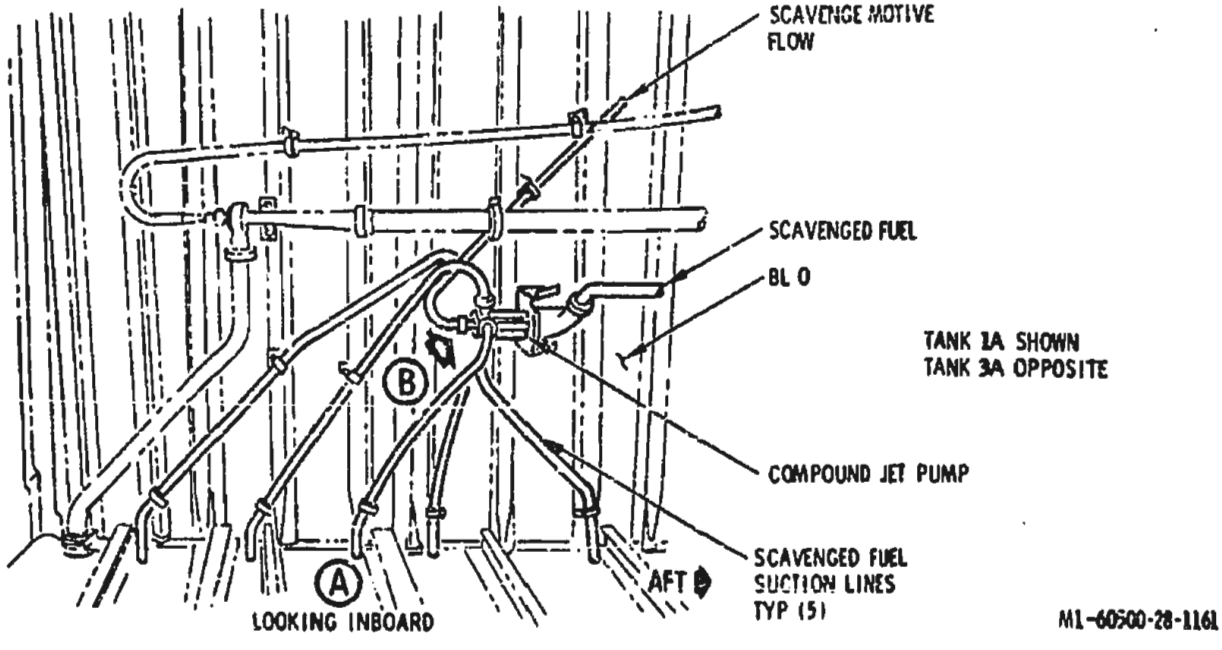
(13) Verify fuel quantity in tank 1A or 3A is reducing at approximately 90 pounds per minute.

CAUTION: VERIFY ZIPPER DOOR IN AIRFLOW BARRIER IS CLOSED.

(14) Close access doors opened in Step 4A(5).

(15) Turn off electrical power.





Compound Jet Pump - Removal and Installation
Figure 401

TANK 1A AND 3A SCAVENGE VALVE - REMOVAL AND INSTALLATION

1. General

Motive fuel flow required for operation of center section tank fuel and condensate jet ejector pumps is acquired from the tank 1 and 3 boost pumps and controlled by tank 1A and 3A scavenge valves. These valves are mounted on the wing center section rear beam in left and right main landing gear wheel wells. Valve actuators are accessible from MLG wheel well areas. Valve body access is acquired by removing a wing center section access panel in the hydraulic service center and entering the aft center section (dry) bay.

2. Equipment and Materials

Preformed Packing (Ref. Fig. 401)

3. Referenced Procedures

6-40-00	Exterior Access Doors and Panels
6-50-00	Interior Access Doors and Removable Panels
12-11-00	Fuel Tank Replenishing - Servicing
24-00-00	Electrical Power System - Maintenance Practices
28-11-00	Fuel Tanks - Maintenance Practices
28-11-00	Tanks - Adjustments and Test
28-22-00	Defueling - Maintenance Practices
32-33-00	Main Landing Gear Inboard Door - Maintenance Practices

4. Removal/Installation

WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF. 28-11-00).

A. Actuator Removal

(1) On Flight Engineer/Second Officers (FE/SO) aft circuit breaker panel CB3, zone 215, open and tag following circuit breakers:

SCAVENGE TANK 1A & 3A (U16)

INBD BOOST PUMP 1 and 3 (U7, U10)

OUTBD BOOST PUMP 1 and 3 (U13, U15)

(2) Open left or right main landing gear inboard door (Ref. 32-33-00).

(3) Locate scavenge valve actuator on wing center section rear beam and disconnect electrical harness plug (Ref. Fig. 401).

(4) Remove actuator attach nuts and washers.

(5) Separate actuator from valve body.

(6) Remove adapter retainer and adapter. Retain adapter for reinstallation on new actuator.

B. Actuator Installation

(1) Verify that circuit breakers opened in Step 4A(1) are opened and tagged.

(2) Install adapter on actuator shaft using new retainer. Bend ends of retainer to secure retainer in position (Ref. Fig. 401).

(3) Using actuator override lever, align actuator shaft adapter with valve shaft and mount actuator on valve body.

(4) Install actuator attach washers and nuts. Tighten nuts 15 to 20 lb in. higher than running torque.

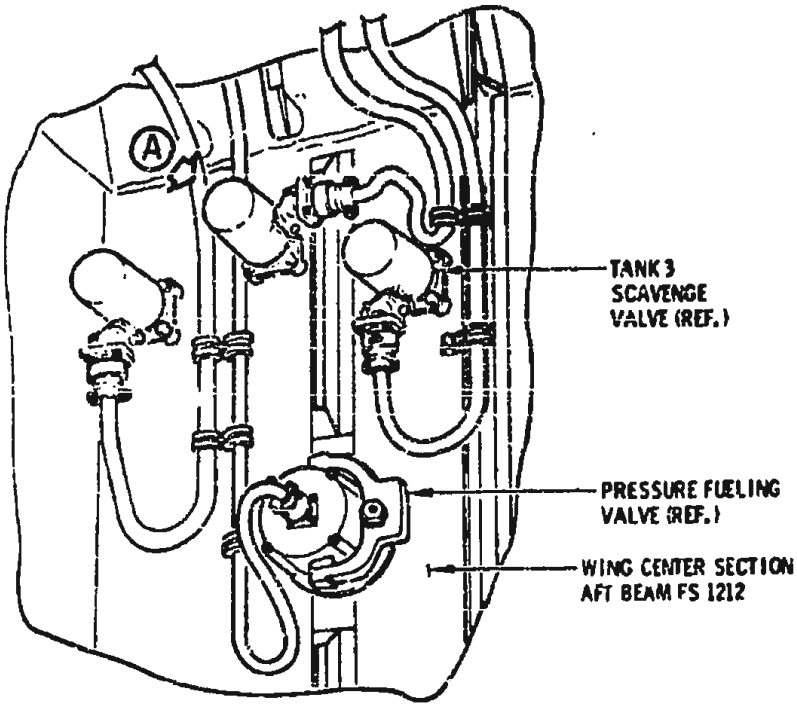
(5) Connect electrical harness plug and add lock-wire.

(6) If valve is not closed, move actuator override lever to CLOSED position.

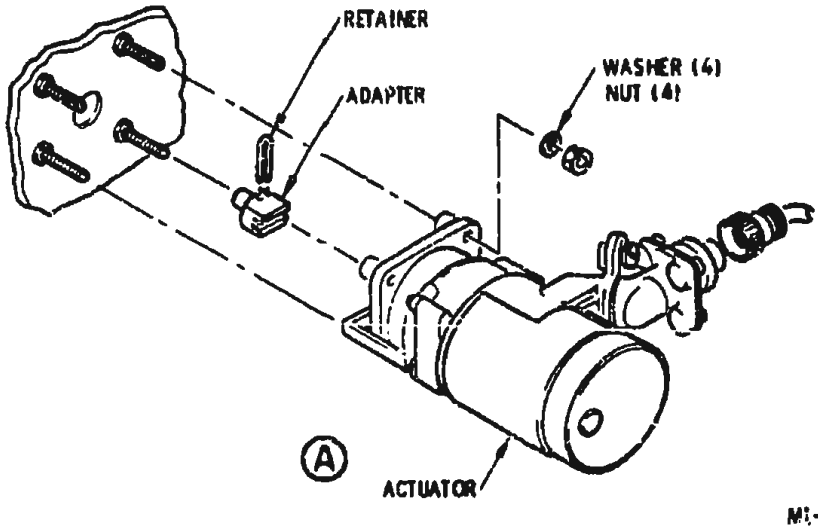
(7) Remove tags and close circuit breakers opened in Step 4A(1).

(8) Check tank 1A and 3A scavenge system operation (Ref. 28-11-00 Tanks - Adjustment and Test).

C. Valve Body Removal



TANK 3A SCAVENGE VALVE IN
RIGHT MLG WHEEL WELL IS SHOWN;
TANK 1A VALVE IN LEFT MLG
WHEEL WELL IS OPPOSITE VIEW



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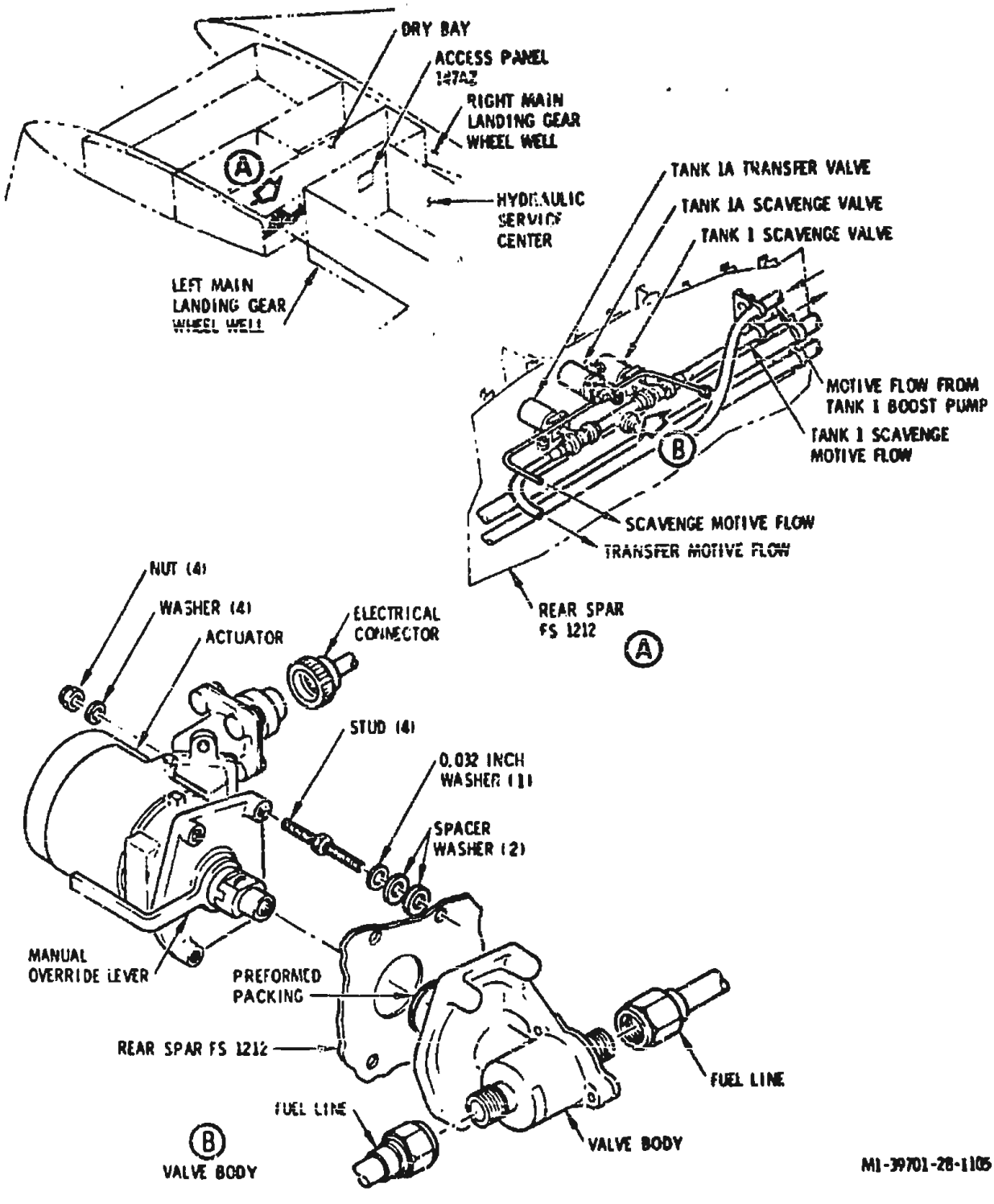
Tank 1A and 3A Scavenge Valve Actuator - Removal and Installation
Figure 401



Actuator and Valve Body - Removal and Installation
Figure 402

(1) Defuel tanks 1 and 1A or 3 and 3A (Ref. 28-22-00).

(2) Remove scavenge valve actuator (Ref. Para. 4A).

(3) Gain access to hydraulic service center through access door 147AB (Ref. 6-40-00).

(4) Remove access panel 147AZ on wing center section rear beam (Ref. 6-50-00).

(5) Set up air mover to ventilate center section aft dry bay area (Ref. 28-11-00).

CAUTION: WEAR AN APPROVED RESPIRATOR WHILE IN THE DRY BAY AND HAVE A SECOND MAN STANDBY IN HYDRAULIC SERVICE CENTER.

THERE WILL BE SOME FUEL LEAKAGE WHEN FUEL LINES ARE DISCONNECTED. HAVE CONTAINER READY TO CATCH FUEL.

(6) Enter center section dry bay and loosen fuel tube B-nuts at scavenge valve body (Ref. Fig. 402).

NOTE: Two spacer washers and a 0.032 inch anti-fretting washer is installed on each valve support stud between the stud hex-head and center section beam. Retain these parts for reinstallation.

(7) Hold valve body while second man in wheel well removes four valve body attach studs.

(8) Remove valve body from aircraft.

(9) Continue to ventilate area.

D. Valve Body Installation

(1) Verify that air mover set up in Step 4C (5) is in place and operating.

NOTE: Wear an approved respirator while in the dry bay and have a second man stand by in the hydraulic service center.

(2) Insert new preformed packing in valve body flange (Ref. Fig. 402).

(3) Install one 0.032 inch washer and two spacer washers (AN960D416, or equivalent) on each of the four valve support studs.

(4) While man in dry bay holds valve body in its installed position, install valve support studs. Tighten studs 85 to 95 lb-inch higher than running torque.

(5) Connect motive fuel line B-nuts to valve body.

(6) Reinstall valve actuator (Ref. Para. 4B).

NOTE: Inspect valve body installation for leaks while doing operational check of valve.

(7) Check operation of applicable tank 1A or 3A scavenge system (Ref. 28-11-00 Tanks - Adjustment and Test).

(8) Remove all tools and equipment from dry bay area and reinstall access panel removed in Step 4D(3).

FUEL PROBE MOUNTING RING - REMOVAL AND INSTALLATION

1. General

R This section contains wing fuel probe mounting ring removal and
R installation procedures. Included are instructions for
R replacing the threaded probe attach screw inserts located in the
R mounting ring.

R 2. Equipment and Materials

R Cleaner, LAC 32-337 or LCM 32-1087 (Ref. 28-11-00)

R Fastener, Hi-Tigue (Ref. Fig. 401)

R Parting Agent, RAM Mold Release No. 225 (RAM Chemicals Co.,
R Gardena Ca.) or equivalent

R Sealant (Ref. 28-11-00)

R Threaded Insert (Ref. Fig. 401)

R Washers, AN906D10

R 3. Referenced Procedures

20-24-04	Electric Bonding and Grounding Connections - Maintenance Practices
28-11-00	Fuel Tanks - Maintenance Practices
28-22-00	Defueling - Maintenance Practices
28-41-01	Fuel Quantity Tank Probe - Removal and Installation
57-33-01	Outer Wing Box, Lower Access Doors - Removal and Installation
R 51-40-01	Structural Repair Manual - Fastener Installation and Removal

R 4. Removal/Installation

WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF. 28-11-00).

A. Removal

R (1) Defuel tank (Ref. 28-22-00).

(2) Purge tank (28-11-00).

R (3) Remove wing access cover listed in Table 401 (Ref
R 57-33-00).

R Probe Mounting Ring Access
R Table 401

Probe number	Tank Access Cover
1	534/634 JB
2	534/634 FB
3	534/634 BB
4	533/633 AB
5	533/633 FB
6	532/632 DB
7	532/632 CB
8	532/632 BB
9	531/631 FB
10	531/631 FB
11	531/631 EB
12	531/631 DB
13	531/631 DB
14	531/631 BB
15	531/631 CB

R (4) Remove probe (Ref. 28-41-01).

R (5) Using sharpened phenolic or plastic scraper, remove
R filler sealant around edges of mounting ring (Ref. Fig.
R 401).

R (6) Remove 5 mounting ring Hi-Tigue fasteners (Ref. R 51-40-01).

R (7) Break sealant bond between clamp ring and mounting ring R by carefully prying between the two parts at the R sealant line visible in the probe insert hole. R Separate clamp ring from mounting ring (Ref. Fig. 401).

(8) Separate insulator from mounting ring.

R (9) Remove all sealant from wing panel opening. Wipe away R sealant residue using clean cloth dampened in cleaner.

R (10) Thoroughly clean and inspect insulator, mounting ring R and clamp ring for continued serviceability. If R existing clamp ring is to be reinstalled, be sure R sealant is removed from 4 No. 40 dia. sealant injection R holes. The mounting ring inserts for probe attach R screws consist of externally and internally threaded R inserts containing a floating lock-nut. Axial locking R pins driven into the tapped mounting ring holes retain R the insert in its installed position. The floating R lock-nut feature compensates for manufacturing R tolerances that could cause binding of the probe R mounting screws. If these inserts are clogged with R sealant, they should be replaced (Ref. Para. 5), or a R new mounting ring installed.

R B. Installation

R (1) Position clamp ring in tank probe recess (top of wing) R Ref. Fig. 401.

R NOTE: To prevent probe attach screw inserts from being R clogged with sealant, do the following steps R exactly as noted.

R (2) Install washers equivalent to thickness of probe R mounting plate (or depth of tank probe recess) on each R of 5 probe attach screws. Coat each attach screw with R film of parting agent.

R (3) Coat 5 Hi-Tigue fasteners with film of parting agent.

R (4) Install insulator on mounting ring with a thin film of R sealant between insulator and mounting ring.

R (5) Hold mounting ring in its installed position (with the R flat section parallel to the wing structure stringer R just aft of the installation) and install the 5 probe R attach screws through the clamp ring and into the R mounting ring inserts.

(6) Install 5 Hi-Tigue fasteners as follows:

(a) Insert Hi-Tigue pin.

(b) Install washer and nut on each pin.

(c) Tighten nut until firmly seated, then back off one turn. (use hex stock to prevent pin rotation).

(7) Inject sealant into four sealant injection holes located in clamp ring (Ref. Fig. 401). Inject sealant until it emerges from the gap between clamp ring and mounting ring.

(8) Allow sealant to cure. When cured retighten Hi-Tigue nuts until firmly seated.

(9) Coat Hi-Tigue washer, collar and nut with sealant.

R (10) Install fillet seal around base of mounting ring and
R remove cured sealant at gap between clamp ring and
R mounting ring.

R (11) Remove all equipment from tank.

R (12) Clean tank of residue accumulated during mounting ring
R replacement.

R (13) Remove probe attach screws and washers installed in
R Step 4B(2).

R (14) Check electrical band between wing surface and clamp
R ring. DC resistance between wing surface and ring must
R not exceed 0.0025 ohms (Ref. 20-24-04).

R (15) Reinstall probe (Ref. 28-41-01).

5. Removal and Installation (Probe Mounting Ring Inserts)

A. Removal

(1) Drill out floating insert using 11/32 dia drill to a maximum depth of 3/32 inch.

(2) Deflect and break off insert locking keys.

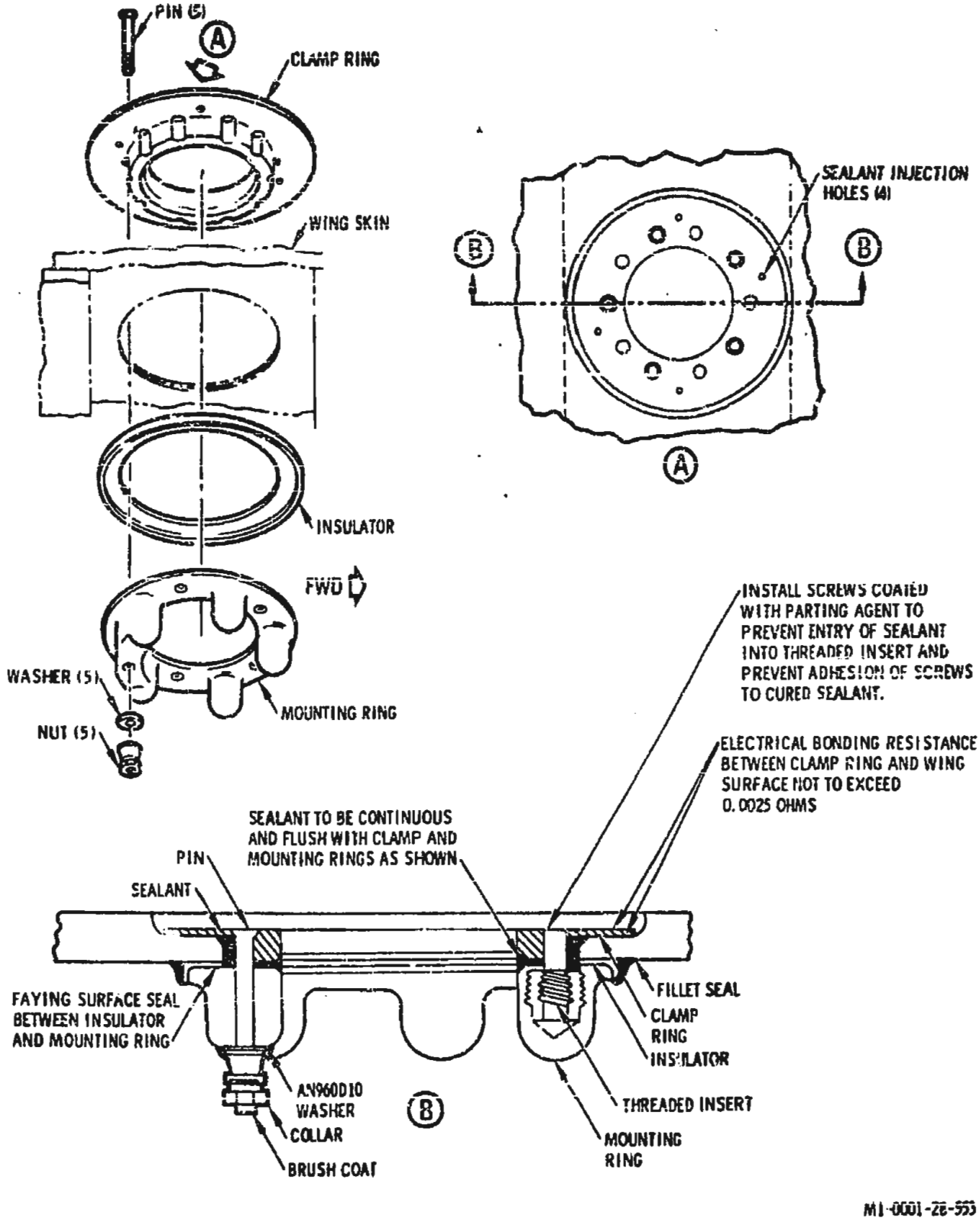
(3) Remove insert using appropriate size screw extractor.

(4) Clean out debris from insert hole.

B. Installation

(1) Install insert until further insert is bottomed out. Top of insert should be .01 to .03 inch below surface of mounting ring.

(2) Drive locking keys flush into mounting ring threads (preferably into grooves made by previous insert installation).



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R Fuel Probe Mounting Ring - Removal and Installation
R Figure 401

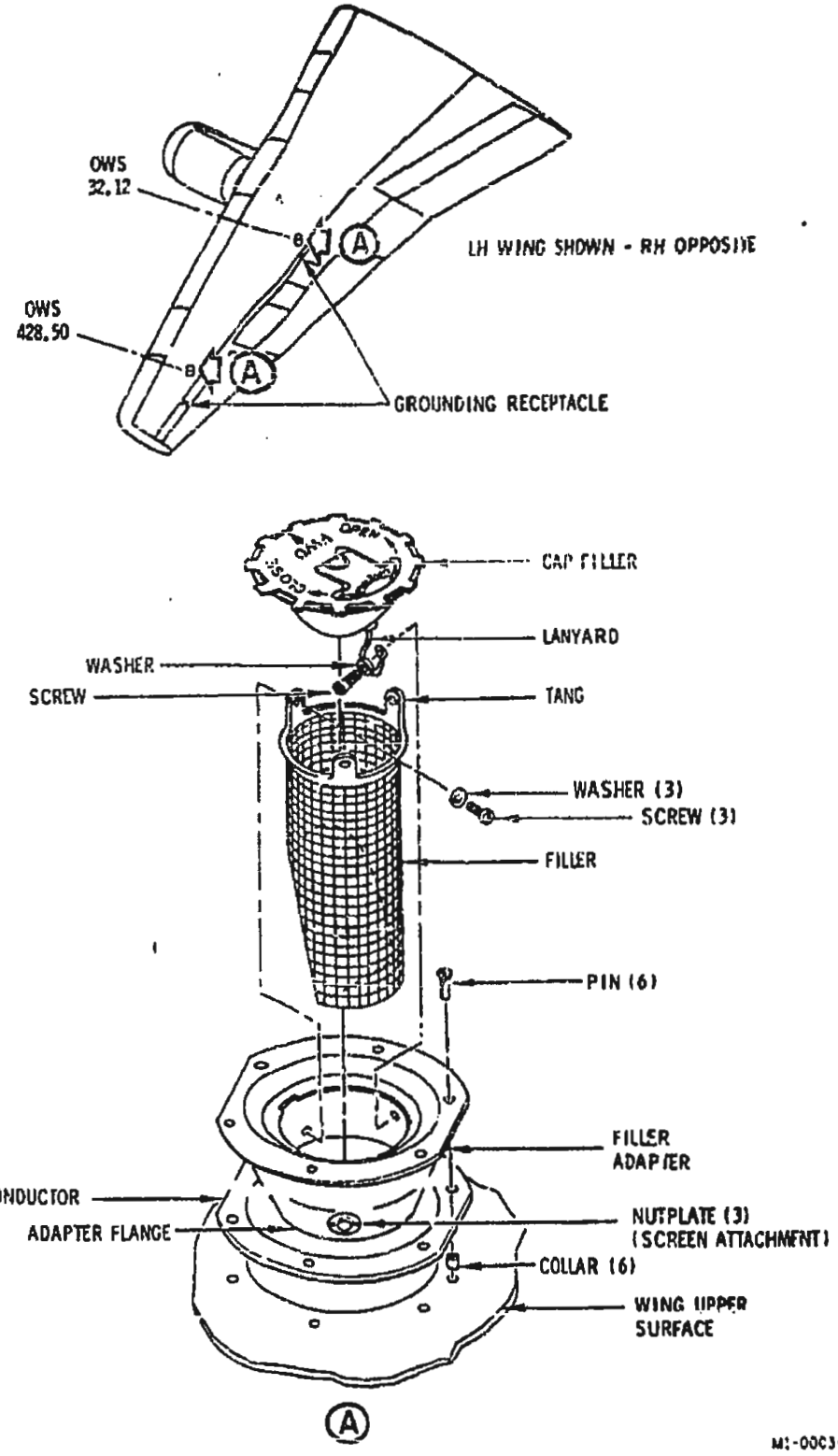
R EFFECTIVITY: ALL
R
0010

GRAVITY FUELING SYSTEM - DESCRIPTION AND OPERATION

R 1. General

R Fueling hose receptacles in the upper wing surfaces permit
R overwing manual fueling of both inboard and outboard sections of
R tanks 2L and 2R (Ref. Fig. 1). There are no receptacles for
R manual fueling ofTanks 1 and 3 or tanks 1/1A and 3/3A on
R aircraft with center section tanks.

R Manual fueling of tanks 1, 1A, 3, and 3A is accomplished by
R maintaining tank 2L and 2R at full levels while fuel is
R transferred to tanks 1, 1A, 3, and 3A through the normally
R closed tank 2L and 2R defueling valves and tank 1, 1A, 3, and 3A
R fueling valves. Fuel jettison valves must be closed and the
R automatic fuel shutoff indexes (set point bugs) on the
R fueling/defueling panel tank 1 and 3 gages must be set to the
R total quantity of fuel required in these tanks (Ref. 12-11-21).



R Gravity Fueling Filler Cap and Adapter
R Figure 1

R TANKS NO. 2L AND 2R FILLER ADAPTER SCREEN - REMOVAL AND INSTALLATION

1. Referenced Procedure

28-12-02 Tanks No. 2L and No. 2R Filler cap - Removal and Installation

2. Removal/Installation

A. Removal (Filler Screen)

(1) Remove filler cap (Ref. 28-12-02).

(2) Using an offset screwdriver, remove screws attaching filler screen to lower flange of filler adapter (Ref. Fig. 401).

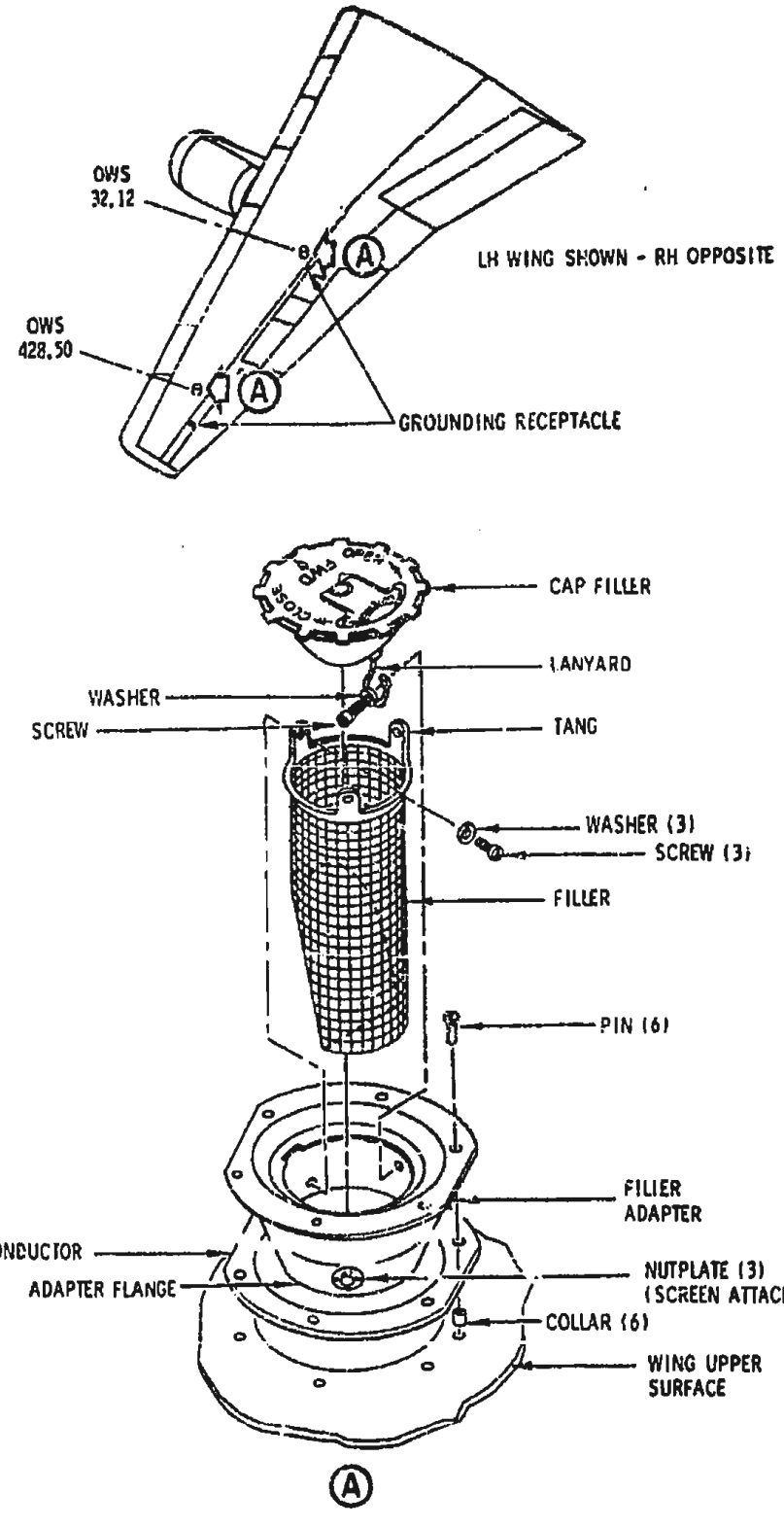
(3) Lift out screen.

B. Installation (Filler Screen)

(1) Insert replacement screen in filler adapter. Align holes in screen tangs with holes in lower flange of filler adapter.

(2) Install screws to attach screen to filler adapter.

(3) Reinstall filler cap (Ref. 28-12-02).



R Tanks No. 2L and 2R Filler Adapter - Removal and Installation
R Figure 401

R TANKS NO. 2L AND 2R GRAVITY FILLER CAP - REMOVAL AND INSTALLATION

R 1. Removal/Installation

R A. Removal

R (1) Raise tab on filler cap and turn counterclockwise.
R Remove cap from the filler adapter.

R (2) Using an offset screwdriver, remove screw which
R attaches the cap retaining lanyard to the inner side of
R the adapter. Retain hardware for installation.

R (3) Remove cap.

R B. Installation

R (1) Attach end of replacement cap lanyard to inner side of
R adapter with screw.

R (2) Seat cap in adapter and turn clockwise. Direction
R arrow on cap must point forward when latched. Push tab
R down flush with surface of cap.

VENT SYSTEM - DESCRIPTION AND OPERATION

1. Description and Operation

R A. Description - Vent System

R The fuel tank open - vent system is installed to prevent
R structural damage to the fuel system and tanks during
R fueling and defueling operations, and pressure equalization
R between tank and ambient pressures for proper fuel flow
R during all aircraft operating conditions. The vent system
R consists of float-operated vent valves, suction relief
R valves, check valves, and vent collector tanks with normal
R and auxiliary vent outlet with flame arrestors.

R B. Operation

R The purpose of the vent collector tanks is to trap residual
R fuel from vent lines and prevent it from escaping overboard.
R They also prevent siphoning of fuel by venting overboard
R through standpipes and out through the flame arrestor. Air
R flowing through the ram-air inlet/outlet carries away fumes
R at velocities exceeding flame propagation rate. An
R auxiliary vent valve is incorporated to provide vent relief
R if the main vent ices up (Ref. Fig. 1).

R Fuel tanks 1, 1A, and 2L are connected to the left wing vent
R collector tank while fuel tanks 3, 3A, and 2R are connected
R to the right wing vent collector tank. All fuel tanks are
R vented to the vent collector tanks by means of vent tubing
R connected to the upper wing vent channels (Ref. Fig. 1).
R Inlets to the vent channels are through open (climb) vents
R located in the foremost inboard corner of each tank. A
R float-actuated (descent) vent valve located in the aft
R outboard area of each tank assist in providing inward
R venting to the tank during descents, and prevents fuel from
R entering the vent pipe during nose-up attitudes. A suction
R relief valve is incorporated in each float valve plenum
R assembly which will vent the tank in case the float-actuated
R vent valve sticks closed.

R The inboard and outboard bays of tanks 2L and 2R are each
R interconnected by vent piping for area pressure
R equalization. Jet scavenge pumps in tanks 2L and 2R
R activated by boost pump motive flow, removes and returns
R scavenged fuel from the vent collector tanks to the outboard
R side of tanks 2L and 2R respectively.

R 2. Vent Collector Tanks

R A. Description and Operation

R The vent collector tanks are in zone 534/634, extending from
R outer tank bulkhead (OWS 440.5) to the wingtip bulkhead (WBL
R 910.4). The vent tanks are formed by the front and rear
R spars, wing skins, and bulkheads OWS 440.5 and WBL 910.4.
R Each vent tank consists of a Spoecker scoop ram air vent
R with standpipe and flame arrestor, which takes fumes away at
R speeds greater than flame propagation rate. An auxiliary
R vent is mounted on access door 534AB and 634AB in case of
R icing of main vent. Residual fuel is scavenged out by a
R scavenge line and returns the fuel to tank 2L or 2R.

R 3. Float-Operated Vent Valve

R A. Description and Operation

R Each of the four float-operated vent valves is secured to a
R vent valve plenum assembly. The valve consists of a
R hinge-mounted float assembly composed of a rigid urethane
R foam valve float, float arm, and a flapper assembly (Ref.
R Fig. 2).

R 4. Suction Relief Valve

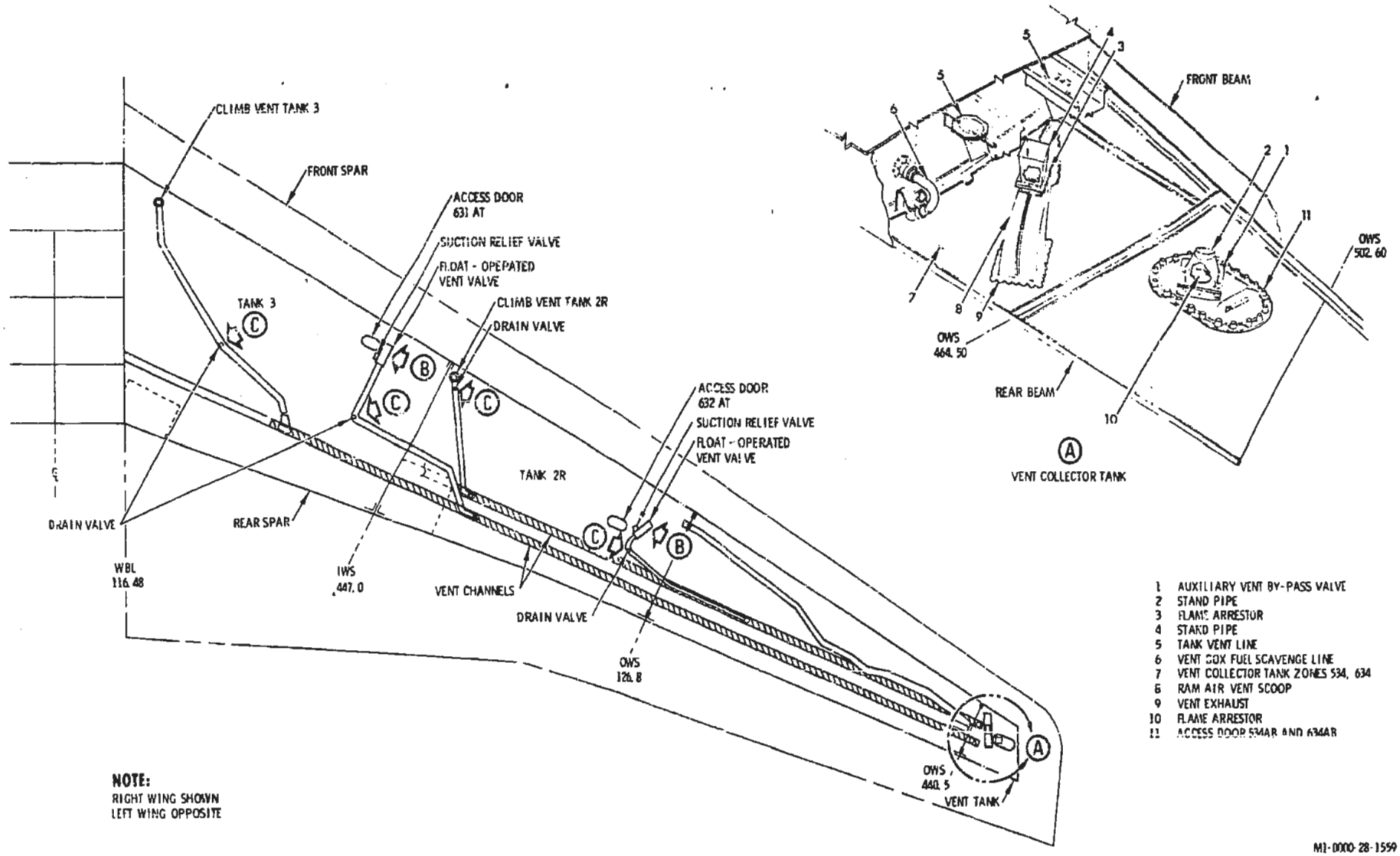
R A. Description and Operation

R The suction relief valve is a flapper-type unit mounted on
R the side of the vent valve plenum assembly. The valve opens
R outward to allow for pressure equalization between tank and
R ambient air pressure in case of float-operated vent valve
R failure. The flapper assembly is composed of spring-loaded
R flapper arm and a flapper assembly. (Ref. Fig. 2).

5. Float-operated Drain Valve

A. Description and Operation

The float-operated drain valve consists of a hollow aluminum ball, a viton washer seat, and a retaining ring in a single housing. The seat has a thin lip which allows the maximum amount of deflection for a minimum amount of force. The retaining ring and housing are so designed that when a backward force is applied, the ring becomes tighter in its groove (Ref. Fig. 3). The purpose of the valve is to permit drainage of fuel in vent line sumps. Rated flow when fully open is 0.16 gpm.



1 AUXILIARY VENT BY-PASS VALVE
2 STAND PIPE
3 FLAME ARRESTOR
4 STAND PIPE
5 TANK VENT LINE
6 VENT BOX FUEL SCAVENGE LINE
7 VENT COLLECTOR TANK ZONES 534, 634
8 RAM AIR VENT SCOOP
9 VENT EXHAUST
10 FLAME ARRESTOR
11 ACCESS DOOR 534AR AND 634AR

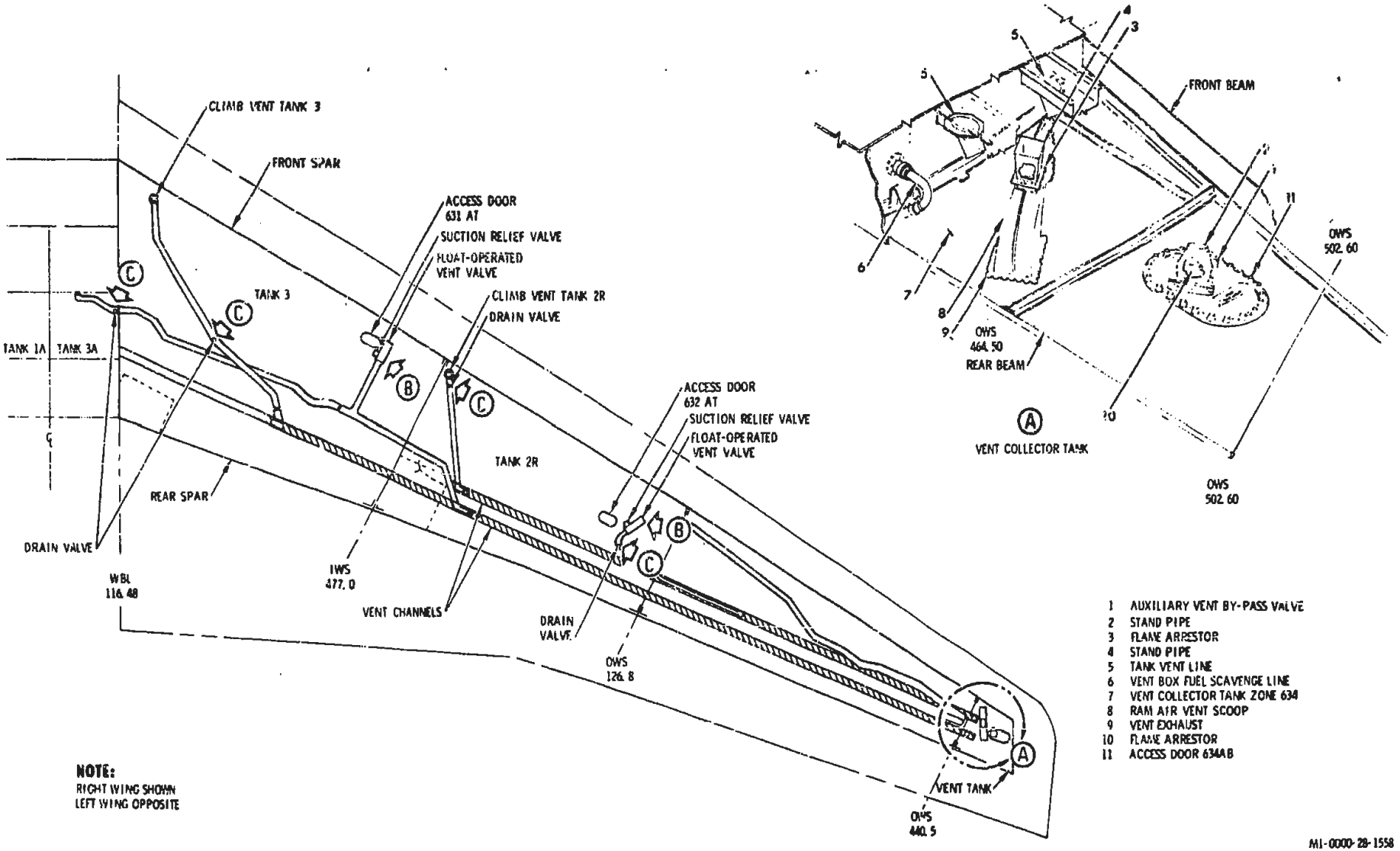
NOTE:
RIGHT WING SHOWN
LEFT WING OPPOSITE

M1-0000-28-1559

R Fuel Vent System
R Figure 1 (Sheet 1)

EFFECTIVITY: 001-024, 027

001B

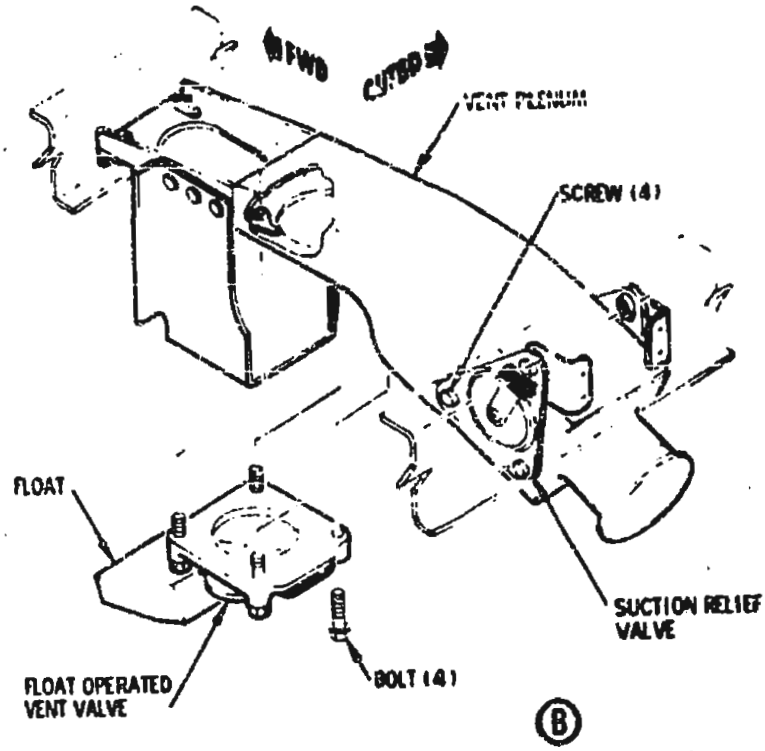


NOTE:
RIGHT WING SHOWN
LEFT WING OPPOSITE

MI-0000-28-1558

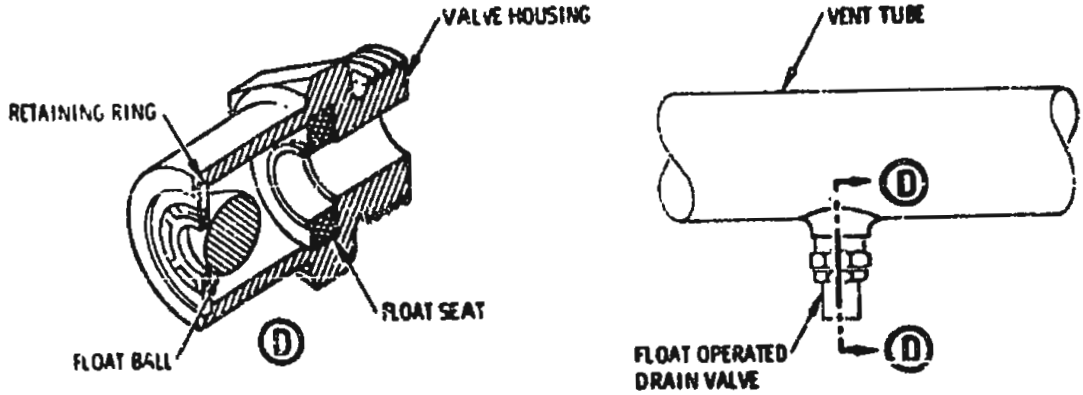
Fuel Vent System
Figure 1 (Sheet 1)

R
R
0018 EFFECTIVITY: 025, 026, 028-999



NOTE:
FLOAT-OPERATED VENT VALVE AT IWS 422.06 IS SHOWN. FLOAT VALVE AT OWS 75.00 IS POINTED OUTBOARD.

(B)
FLOAT-OPERATED VENT VALVE



(C)
TYPICAL FLOAT-OPERATED DRAIN VALVE

M1-0000-28-1503

R
R
Fuel Vent System
Figure 1 (Sheet 2)

EFFECTIVITY: ALL

001D

VENT SYSTEM FLAME ARRESTORS - REMOVAL AND INSTALLATION

1. General

R Two flame arrestors are located in each wing vent system collector box. One flame arrestor is installed in the vent ram-air scoop; the second one is in the collector box lower wing surface access plate just below the auxiliary vent relief valve.

R 2. Equipment and Materials

R Gasket (Ref. Fig. 401, 402)

R MIL-A-5092, Type III, or equivalent, Buna-N rubber base adhesive

R TT-N-95 Aliphatic Naptha, or equivalent, Solvent (LCM-32-1087 is approved equivalent)

3. Referenced Procedures

28-11-00 Fuel Tanks - Maintenance Practices

R 28-13-01 Vent System Flame Arrestors - Inspection and Check

57-33-01 Access Cover Plates and Doors - Removal and Installation

R 4. Removal/Installation

WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF. 28-11-00).

R A. Removal (Vent Scoop Flame Arrestor)

R (1) Remove vent collector tank access plate 534AT/634AT (Ref. 57-33-01).

(2) Remove fasteners at base of standpipe (Ref. Fig. 401).

(3) Remove standpipe.

(4) Remove flame arrestor.

R (5) Remove gasket adhesive residue from flanges of standpipe and vent scoop flange using cloth wetted with TT-N-95 aliphatic naptha, or approved equivalent solvent. Wipe with clean dry cloth before solvent dries.

R B. Installation (Vent Scoop Flame Arrestor)

R (1) Seat flame arrestor in vent scoop (Ref. Fig. 401).

R (2) Apply thin brush coat (or spray coat) of Buna-N rubber base adhesive to both sides of standpipe gasket.

R (3) Place gasket on vent scoop flange.

R (4) Place standpipe in position and secure to standpipe to vent scoop with screws and washers.

R NOTE: Screws thread into anchor nuts on lower side of vent scoop flange.

R (5) Install upper wing surface access plate 534AT/634AT (Ref. 57-33-01).

R C. Removal (Auxiliary Vent Flame Arrestor)

R (1) Remove lower wing surface access plate 534AB/634AB (Ref. 57-33-01).

R (2) Remove auxiliary vent relief valve and standpipe assembly (Ref. Fig. 402).

R (3) Remove flame arrestor and standpipe gasket.

R (4) Remove gasket adhesive residue from standpipe and vent scoop flange using cloth wetted with TT-N-95 aliphatic naptha, or approved equivalent solvent. Wipe dry with clean dry cloth before solvent dries.

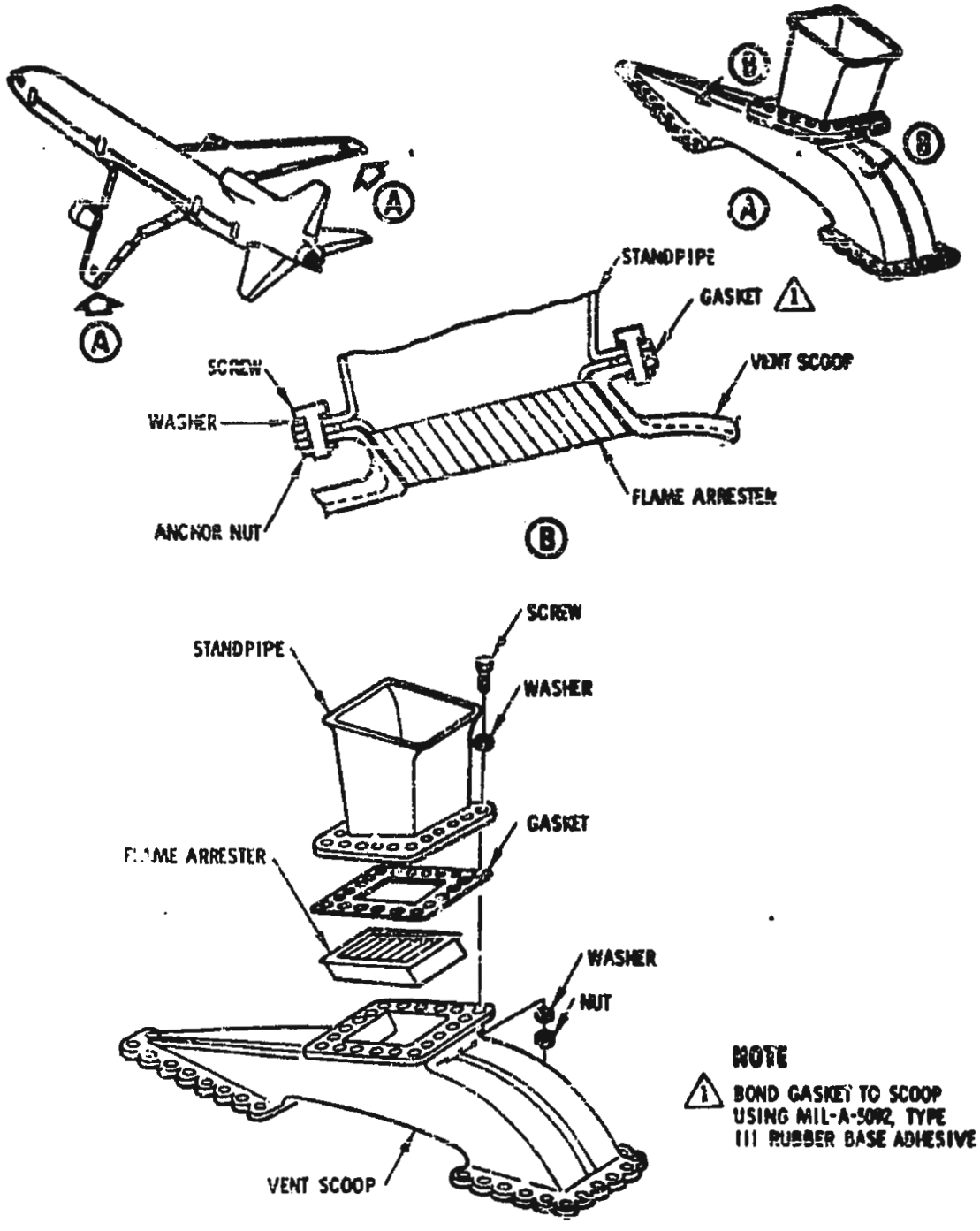
R D. Installation (Auxiliary Vent Flame Arrestor)

R (1) Seat flame arrestor in support fitting (Ref. Fig. 402).

R (2) Install new gasket as directed in Step 4B(2) and (3).

R (3) Install relief valve and standpipe assembly.

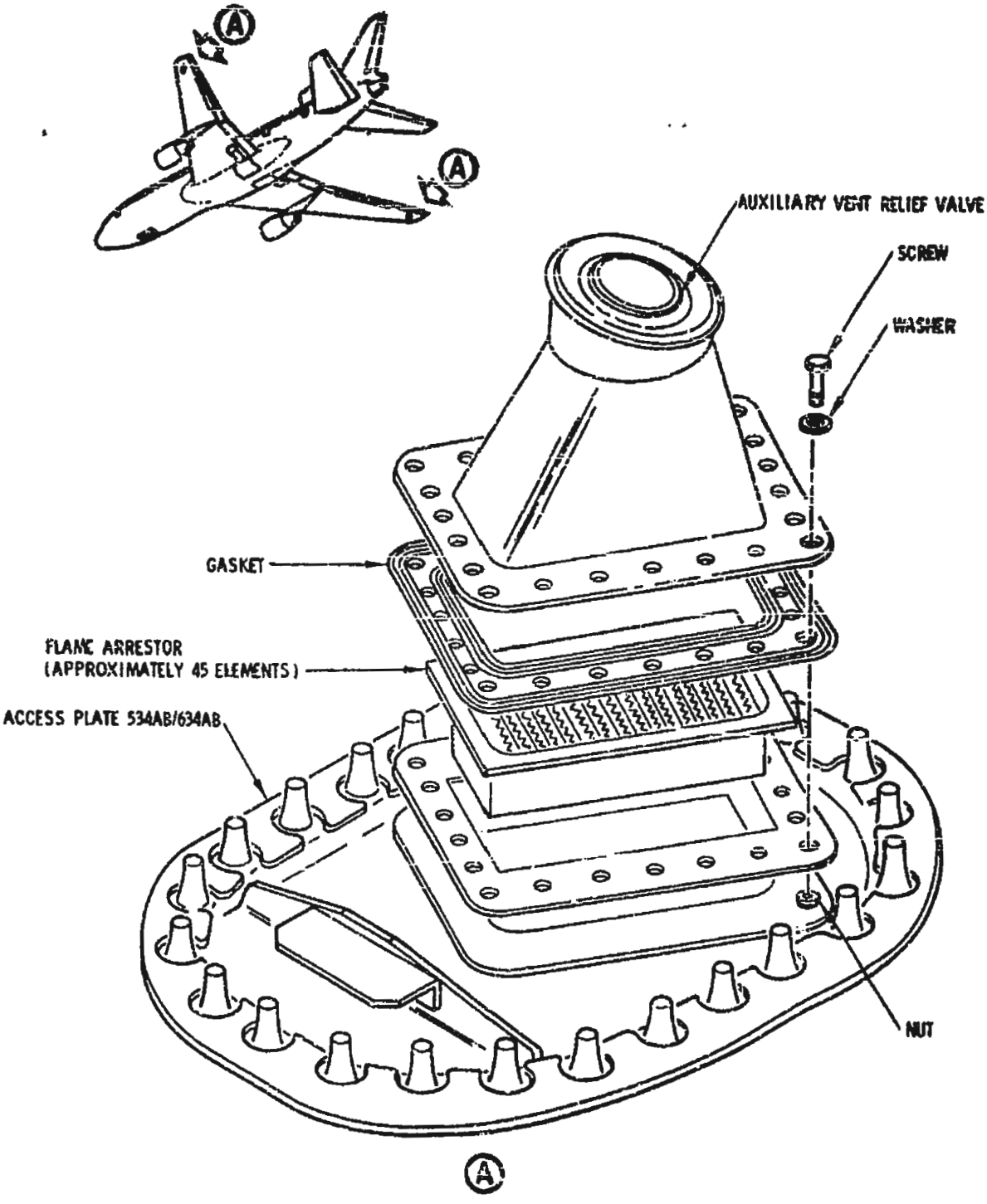
R (4) Reinstall access door 534AB/634AB (Ref. 57-33-01).



M1-0101-28-1219

R Vent Scoop Flame Arrestor - Removal and Installation
R Figure 401

EFFECTIVITY: ALL



M1-C001-28-1218

R Auxiliary Vent Flame Arrestor - Removal and Installation
R Figure 402

EFFECTIVITY: ALL

001B

VENT SYSTEM FLAME ARRESTORS - INSPECTION AND CHECK

1. General

Two vent system flame arrestors are installed in each wing vent collector box. One flame arrestor is at the interface flange between the collector box ram-air inlet scoop and vent stand-pipe located inside the box. Access to this flame arrestor for inspection and replacement is acquired by removing upper wing surface access plate 534AT/634AT located directly above the flame arrestor. The second flame arrestor is part of the collector box auxiliary vent installation that is mounted on and a part of collector box access plate 534AB/634AB located in the lower wing surface. This flame arrestor may be inspected by viewing the unit from a location below the outer wing panel.

2. Referenced Procedures

28-13-01	Vent System Flame Arrestors - Removal and Installation
57-33-01	Access Cover Plates and Doors - Removal and Installation

3. Inspection/Check

A. Vent Scoop Flame Arrestor

(1) Remove upper wing surface access plate 534AT/634AT (Ref. 57-33-01).

(2) Inspect flame arrestor for clogged, damaged, and/or loosely packed elements. A properly packed flame arrestor will normally have 45 ±2 elements securely installed in the flame arrestor frame with no looseness between the elements. Replace the flame arrestor if any portion of the element is damaged or any looseness in the element pack is detected (Ref. 28-13-01, Removal and Installation).

NOTE: Some arrestors may be in-service with as few as 41 elements. These arrestors may be retained in-service if securely retained with no gaps or discernible looseness.

(3) Reinstall access plate removed in Step 3A(1).

B. Auxiliary Vent Flame Arrestor

(1) From a location below the outer wing panel, inspect the flame arrestor located in wing access plate 534AB/634AB as noted in Step 3A(1). Remove the access plate and replace the flame arrestor if it does not meet the noted inspection criteria (Ref. 28-13-01, Removal and Installation).

R

VENT TANK FUEL SCAVENGE LINE CHECK VALVE REMOVAL AND INSTALLATION

1. General

R R R One vent tank fuel scavenge line check valve is located in tank 2L and one in tank 2R on the inboard side of the vent collector tank to fuel tank separation rib at outer wing station 440.50.

2. Referenced Procedures

	28-11-00	Fuel Tanks - Maintenance Practices
R	28-20-01	Couplings - WIG-O-FLEX - Maintenance Practices
R	28-22-00	Defueling - Maintenance Practices
	57-33-01	Access Cover Plates and Doors - Removal and Installation

3. Removal/Installation

WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF. 28-11-00).

A. Removal

R R R (1) Defuel tank 2L/2R outboard section to a level sufficient to prevent spillage of fuel when lower wing access cover 534KB/634KB is removed (Ref. 28-22-00).

R R (2) Remove tank 2L/2R lower wing access cover 534KB/634KB (Ref. 57-33-01).

R (3) Remove upper wing vent tank access cover 534AT/634AT.

R R (4) Disconnect scavenge line check valve tube couplings (Ref. 28-20-01).

R R (5) Remove bolts, washers, and nuts, and remove valve. Clean sealing compound from wing rib surfaces.

B. Installation

R R (1) Wet valve attach bolts with sealing compound and install valve.

(2) Install fillet sealant around edges of valve flange (Ref. 28-11-00).

(3) Connect tube couplings to check valve (Ref. 28-20-01).

R (4) Reinstall vent box and tank 2L/2R access covers (Ref. 57-33-01).

(5) Allow sufficient time for sealing compound to cure
R before refueling tank 2L/2R outboard section (Ref.
R 28-11-00, Para. 7).

FLOAT-OPERATED VENT VALVE - REMOVAL AND INSTALLATION

1. General

Float-operated vent valves are mounted on the vent plenums in each inboard and outboard fuel tank at inner wing station 422.06 (inboard tank) and outer wing station 75.00 (outboard tank).

2. Referenced Procedures

28-11-00	Fuel Tanks - Maintenance Practices
28-22-00	Defueling System - Maintenance Practices
57-33-01	Access Cover Plates and Doors - Removal and Installation

3. Removal/Installation

WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF. 28-11-00).

A. Removal

(1) Defuel tank in which valve is to be replaced (Ref. 28-22-00).

(2) Remove fuel tank access cover 531AT/631AT at inner wing station 422.06 or 532AT/632AT at outer wing station 75.00 (Ref. 57-33-01).

R (3) Purge tank (Ref. 28-11-00).

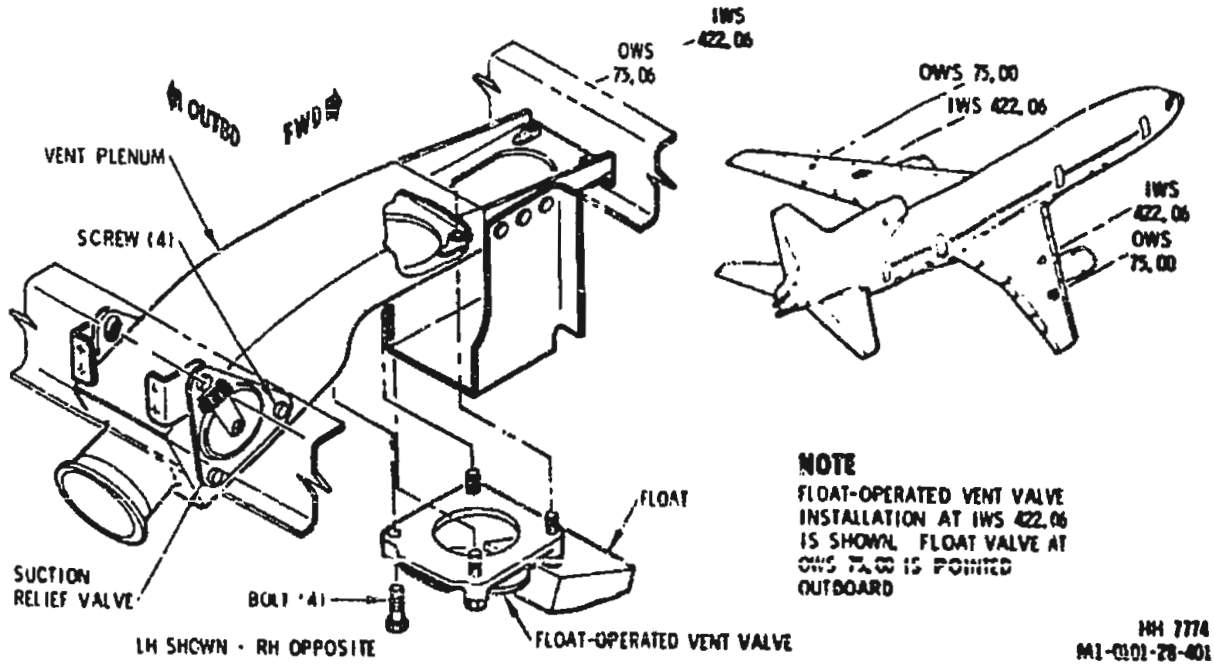
(4) Unscrew captive bolts which attach valve to plenum (Ref. Fig. 401).

(5) Remove valve.

B. Installation

(1) Install float-operated vent valve on plenum. (Install valve in outboard tank with float pointed outboard. Install valve in inboard tank with float pointed forward).

(2) Install fuel tank access cover (Ref. 57-33-01).



Float-operated Vent Valve - Removal and Installation
Figure 401

SUCTION RELIEF VALVE - REMOVAL AND INSTALLATION

1. General

A suction relief valve is installed on the vent plenum in each inboard and outboard fuel tank (Ref. Fig. 401). The installation is similar in all four tanks. Access to valve located at inner wing station 422.06 in the inboard tank is upper surface door 531AT (631AT). Access to valve located at outer wing station 75.00 in the outboard tank is upper surface door 532AT (632AT).

2. Referenced Procedures

R 28-11-00 Fuel Tanks - Maintenance Practices

28-22-00 Defueling System - Maintenance Practices

57-33-01 Access Cover Plates and Doors - Removal and Installation

3. Removal/Installation

R WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL
R SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY
R GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES.
R OBSERVE ALL SAFETY REGULATIONS (REF. 28-11-00).

A. Removal

(1) Defuel tank in which valve is to be replaced (Ref. 28-22-00).

R (2) Purge tank (Ref. 28-11-00).

R (3) Remove wing upper surface access door 531AT (631AT) or
R 532AT (632AT).

R (4) Remove bolts attaching suction relief valve to the vent
R plenum (Ref. Fig. 401).

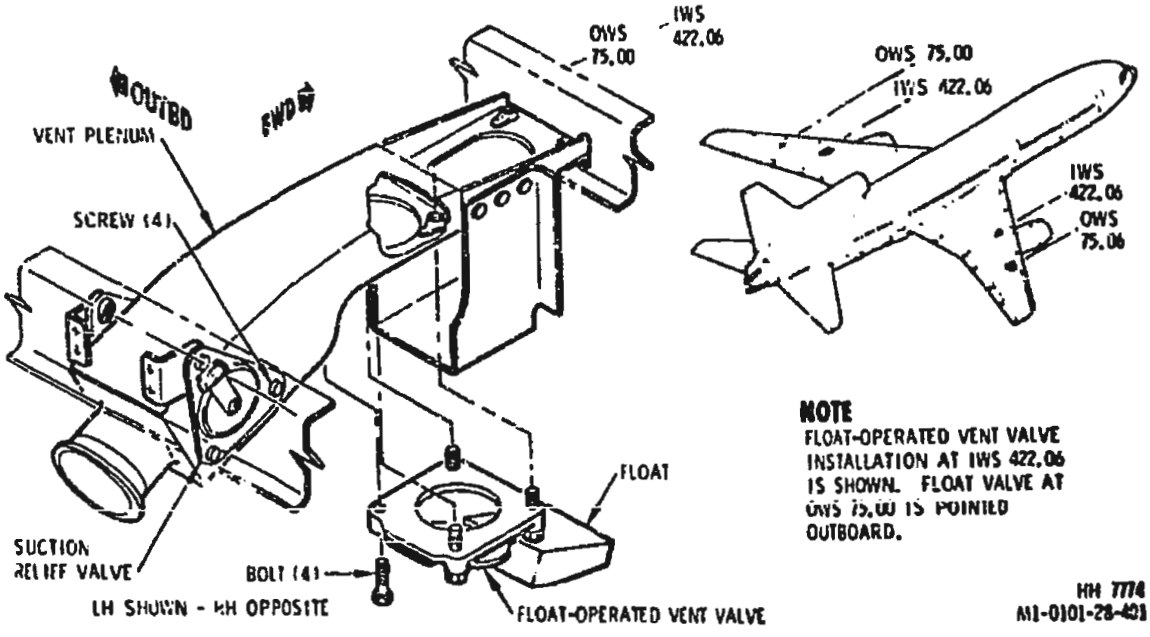
R (5) Remove valve.

B. Installation

(1) Install suction relief valve on vent plenum with bolts and washers.

(2) Verify that spring closes valve fully.

(3) Install access door in wing upper surface (Ref. 57-33-01).



Suction Relief Valve - Removal and Installation
Figure 401

VENT TUBE FLOAT-OPERATED DRAIN VALVE - REMOVAL AND INSTALLATION

1. General

Float-operated drain valves are installed in vent tubes in tanks No. 1 and 3 inboard of ribs at inner wing stations (IWS) 293.58 and 425.70, and in tanks No. 2L and 2R outboard of ribs at IWS 477.70 and outer wing station 78.40.

2. Equipment and Materials

Packing (Ref. Fig. 401)

3. Referenced Procedures

R	28-11-00	Fuel Tanks - Maintenance Practices
	28-22-00	Defueling System - Maintenance Practices
	57-33-01	Access Cover Plates and Doors - Removal and Installation

4. Removal/Installation

R WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL
R SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY
R GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES.
R OBSERVE ALL SAFETY REGULATIONS (REF. 28-11-00).

A. Removal

(1) Defuel tank in which valve is to be replaced (Ref. 28-22-00).

R (2) Purge tank (Ref. 28-11-00).

R (3) Remove access door (Ref. 57-33-01).

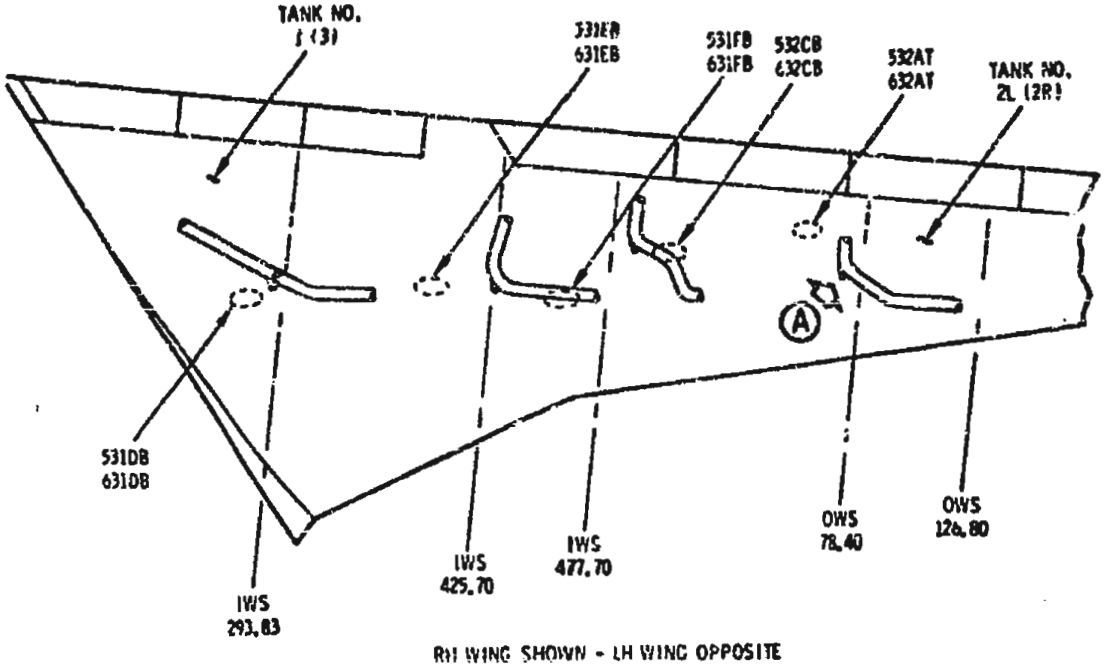
R (4) Locate valve in tank interior (Ref. Fig. 401).

R (5) Remove valve from vent tube boss. Discard packing.

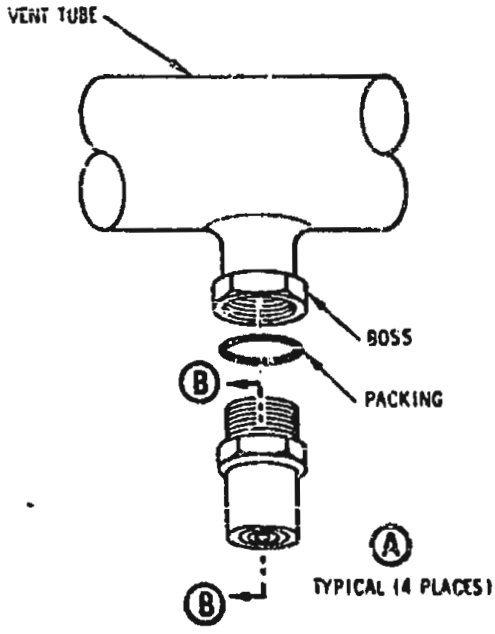
B. Installation

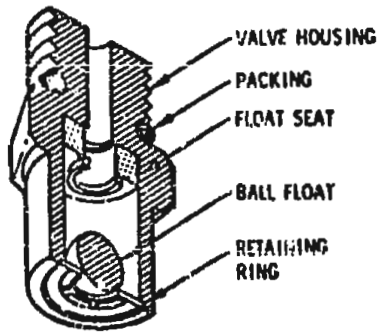
(1) Install valve in vent tube boss using new packing.

(2) Install access door (Ref. 57-33-01).



RH WING SHOWN - LH WING OPPOSITE





VALVE DETAIL

HA 0079
M1-0100-28-190

R Vent Tube Float-operated Drain Valve - Removal and Installation
R Figure 401

VENT BYPASS VALVE - REMOVAL AND INSTALLATION

1. General

Vent bypass valves are installed in the vent boxes in each wing at outer wing station 464.50. The valves are attached to supports mounted on access doors 534AB (left wing) 634AB (right wing). The left and right wing vent box access doors are not interchangeable.

2. Referenced Procedures

28-11-00	Fuel Tanks - Maintenance Practices
57-33-01	Access Cover Plates and Doors - Removal and Installation

3. Removal/Installation

WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF. 28-11-00).

A. Removal

(1) Remove applicable access door 534AB or 634AB (Ref. 57-33-01).

(2) Remove screws, nuts, and washers from base flange of valve and upper flange of support (Ref. Fig. 401).

(3) Lift valve from support.

(4) Clean sealing compound from surface of upper flange of support.

B. Installation

R (1) Coat surface of upper flange of support with faying surface sealing compound (Ref. 28-11-00, Para. 7).

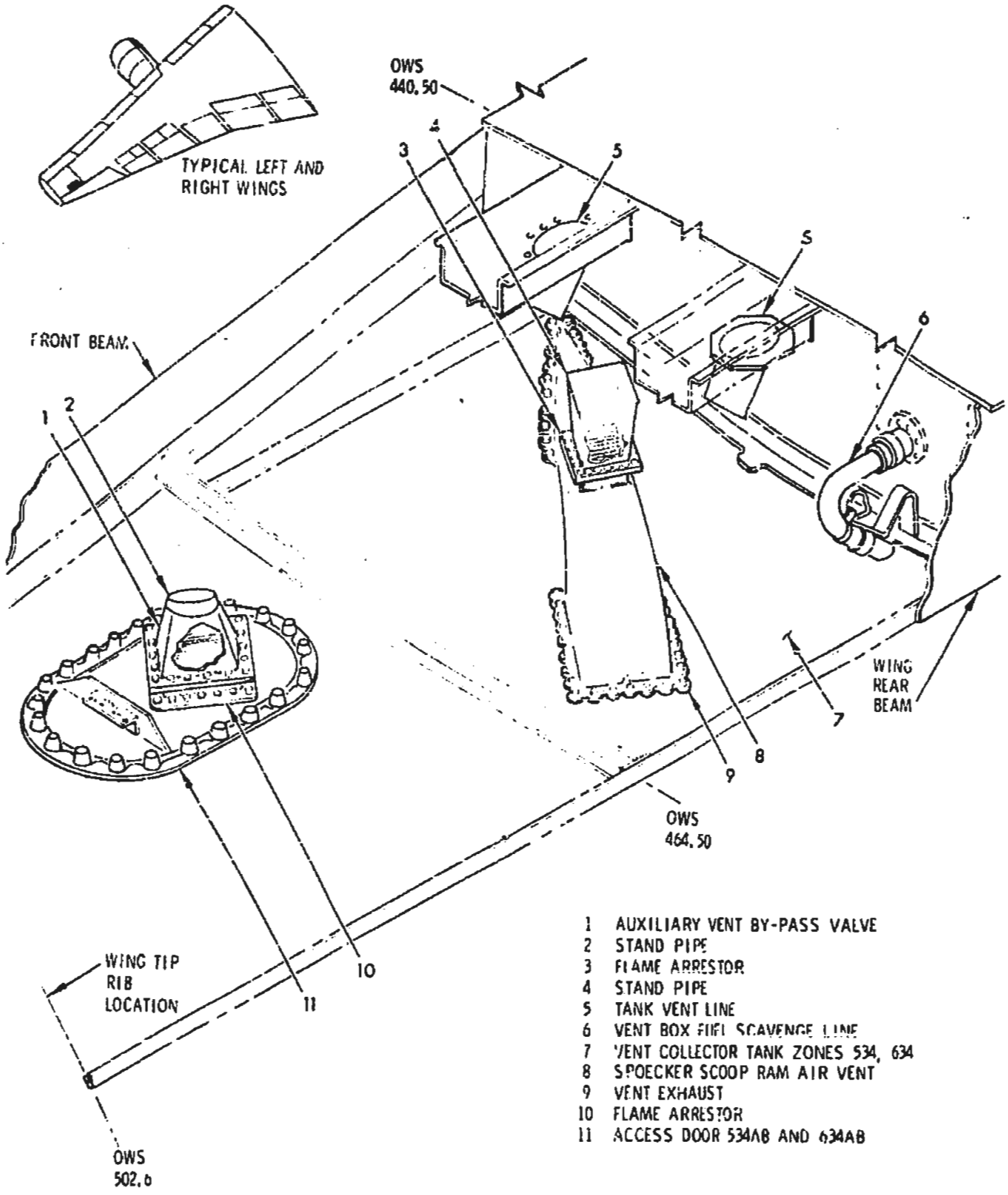
(2) Place vent valve on flange of support.

(3) Coat threads of screws with sealing compound and install (Ref. Fig. 401).

(4) Brush-coat sealing compound over screw heads and nuts and around edges of flanges.

R R (5) Allow sealing compound to cure (Ref. 28-11-00, Para. 7).

(6) Install access door (Ref. 57-33-01).



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M1-0100-28-147

R Vent Bypass Valve - Removal and Installation
R Figure 401

DISTRIBUTION - DESCRIPTION AND OPERATION

1. General

The fuel system stores and delivers fuel to the engines and APU. To insure a positive fuel supply to the engines, each wing tank contains a surge box (sump) holding approximately 1000 pounds (454 Kg) of fuel located in the inboard section at the rear spar. Flapper check valves in the walls of the surge boxes retain fuel to provide a positive supply for engine operation, including conditions with pump and motor assemblies inoperative. Two pump and motor assemblies mounted in each surge box deliver fuel at approximately 25 psi to their respective engines. Pump and motor assemblies are designed to operate continuously during all flight modes. A crossfeed system assures adequate fuel
R supply to all engines operating conditions.

On aircraft 025-026 and 028-999, fuel in wing center section tanks 1A and 3A is normally transferred to companion wing tanks 1 and 3 by a jet ejector pump fuel transfer system or by gravity flow through electrically actuated tank interconnect valves (Ref. 28-27-00).

The boost pump arrangement consists of two ac motor-driven pump assemblies housed in a dual module assembly. Design of the module allows replacement of either motor and pump assembly without draining the fuel tanks. Indexing assures that the motor and pump assemblies will be correctly installed into the housing. Each pump of the dual unit utilizes electrical power from different ac buses, and is capable of supplying maximum fuel requirements for two engines. Fuel tank isolation valves, crossfeed valves, and emergency shutoff valves for each engine and the APU, are dc motor operated. The tank isolation valves and the crossfeed valves are individually controlled by switches on the Flight Engineers/Second Officers FUEL SYSTEM control panel. Emergency shutoff valves are controlled by the engine emergency shutoff handles located on the pilots overhead panel, and the APU emergency shutoff handle located on the Flight Engineer/Second Officers upper control panel and the APU external control panel. The crossfeed valves are not affected by the emergency system operation. Each emergency shutoff valve incorporates a manual override control handle for use during maintenance operations. During normal operation, valves are operated by electrical power from the dc bus; for emergency operation, power is supplied by the battery.

A jet pump fuel scavenging system, operated by motive fuel supplied by the boost pumps, maintains a continuous circulation of fuel from the low (sump) areas of each tank to the respective tank surge box. The system fulfills two primary purposes: it

augments the surge box flapper check valve function in keeping the boost pumps submerged, and it syphons moisture laden fuel from the low tank areas to the boost pump fuel inlets where it is combined with fuel being pumped to the engines. In addition, the tank 2L and 2R fuel scavenge system assists in maintaining a correct distribution of fuel between the tank inboard and outboard sections by returning fuel that may have migrated to the inboard section back to the outboard section. This system will also return fuel in the vent boxes to the 2L/2R tanks. On aircraft equipped with an L-1011-100 center section tank system, a similar system becomes active at takeoff to scavenge condensate laden fuel from the center section tank (1A and 3A) sump areas. Each tank is equipped with push-to-open type, sump drain valves. These drain valves are equipped with primary and secondary poppet seals. Replacement of the primary seal can be accomplished without draining the fuel tank.

A fuel system diagram showing components associated with management of fuel distribution is shown in Section 28-00-00.

C FUEL LEAKAGE - MAINTENANCE NOTES, DATA, TOLERANCES & REGULATIONS

C 1. Maintenance Tolerances and Fuel Leakage Limits

C A. The following fuel leakage limits for L-1011 aircraft are
C maximum in service limits. Leakage above these limits must
C be corrected immediately prior to further flight. Leakage
C below these limits should be corrected as rapidly as
C possible, i.e., the next major station layover.

C (1) Number 1 and 3 pylon fuel line coupling drains = 40
C drops per minute.

CR (2) Fuel transfer from tanks 2L/2R outboard to inboard
CR section = 1,200 lbs. per hour Limit for each tank.

C (3) Fuel shroud drain mast = 40 drops per minute.

C 2. Unwanted Fuel Transfer Corrections

C A. The following procedure may be used to correct an unwanted
C fuel transfer between two tanks when a contaminated by-pass
C check valve is suspected. This procedure may clear the
C contamination from the check valve without a tank entry.

C (1) Determine which fuel tank is increasing in fuel or the
C fuel tank that is not decreasing in quantity as fast as
C normally expected.

C (2) With an engine operating at high idle:

C (a) Open any cross feed valves required to allow the
C engine to be fed from the suspected fuel tank as
C determined by step (1).

C NOTE: It is preferred that a direct tank to
C engine procedure be used when possible.

C (b) Cycle the boost pumps in the suspected fuel tank
C "on" for 15 to 20 seconds then "off" for 15 to 20
C seconds.

C (c) Repeat the boost pump "on" and "off" cycling
C procedure 5 or 6 times.

C (d) Shut off boost pumps in the suspected fuel tank.

C NOTE: The engine may also be shut down at this
C time.

CR (e) Turn on any other tank boost pump(s) and open the
CR appropriate crossfeed valve to pressurize the fuel
CR feed line to the suspect fuel tank.

CR (f) Using the fuel quantity gages (or equivalent)
CR check for any fuel transfer into the tank after
CR 20-30 minutes of operation.

CR (g) If no fuel transfer is noted, the fuel transfer
CR problem may be considered corrected.

WIG-O-FLEX COUPLINGS - MAINTENANCE PRACTICES

1. General

Fuel distribution manifolds, vent system ducting, and tube assemblies larger than one-inch diameter are interconnected by WIG-O-FLEX flexible and rigid tube (MIN-O-MAL) couplings employing swaged ferrules and MS 29513 type O-rings. Standard MS type flareless fittings are installed on tubing assemblies of one inch (or less) diameter.

2. Equipment and Materials

R Grease, MIL-S-8660, or equivalent

O-rings (Ref. Fig. 201 and 202)

Lock-wire, Fed. Spec. QQ-W-390, 0.032-inch diameter, or equivalent

Snap-ring pliers, Truarc 2400, or equivalent

3. Maintenance Practices

A. Disassembly (Flexible 6300 Series Coupling)

(1) Verify that fuel line or manifold is drained.

(2) If the connection is a half coupling type having a nut that screws onto a fitting boss (Ref. Fig. 201), disassemble the coupling as follows:

(a) Remove lock-wire and loosen nut.

(b) Loosen tubing support clamps as necessary to permit extraction of swaged ferrule end of tube, coupling washers, and O-ring from the fitting boss.

(c) Remove component being replaced.

(3) If the connection is a full coupling type having a body and nut (Ref. Fig. 201), disassemble the coupling as follows:

(a) Remove lock-wire and separate nut from the body.

(b) Slide the body out of its installed position to expose the retainer, O-rings, and split-washers.

(c) Remove retainer (two parts).

(d) Remove component or tube assembly being replaced.

(e) Remove O-ring, split-washer, and body (or nut) from removed part. Discard O-ring and retain other coupling parts for reinstallation.

(f) Remove and discard O-ring on part remaining in the aircraft.

B. Assembly (Flexible 6300 Series Coupling)

(1) If connection is a half coupling type having a nut that screws onto a fitting boss (Ref. Fig. 201), assemble the coupling as follows:

(a) Remove first split-washer and existing O-ring; discard O-ring. Lubricate and install new O-ring, then replace split-washer. Apply film of specified grease to washers.

(b) Install component.

(c) Slide swaged end of tubing into fitting boss.

(d) Install coupling nut and hand-tighten until firmly seated.

(e) Install lock-wire between coupling nut and fitting. Bend lock-wire pigtail into contact with fitting or coupling nut.

(2) If connection is a full coupling type having a nut and body (Ref. Fig. 201), assemble the coupling as follows:

(a) Install body (or nut), split-washer, and O-ring, lubricated with specified grease, onto tubing or coupling adapter of new component.

(b) Install lubricated O-ring on tubing (or component) in aircraft.

(c) Install component.

(d) Install retainer (two parts).

(e) Slide split-washers and O-rings into contact with retainer. Apply thin film of specified grease on outer surfaces of retainer and washers.

(f) Slide coupling body into its installed position over the stacked parts.

(g) Install coupling nut and hand-tighten until firmly seated.

(h) Install lock-wire between coupling nut and body. Bend lock-wire pigtail into contact with coupling nut on body.

C. Disassembly (Rigid 8300 Series Coupling)

(1) Verify that fuel line or manifold is drained.

(2) Remove lock-wire and separate coupling nut from swaged body (Ref. Fig. 201).

(3) If tube assembly is being replaced, disenage tube support clamps and remove tube. Discard O-ring installed in machined groove of swaged body.

(4) If component having the swaged body is being replaced, loosen tube support clamps as necessary and remove component. Discard O-ring.

D. Assembly (Rigid 8300 Series Coupling)

(1) If component having the swaged body is being replaced, install the component.

(2) Lubricate a new O-ring with specified grease and install in machined groove in flange of swaged body (Ref. Fig. 201). Move tube assembly into contact with flange of swaged body and install nut. Hand-tighten nut until firmly seated.

(3) If tube assembly is being replaced:

(a) Install nut and split-washer.

(b) Lubricate new O-ring with specified grease and install in groove of swaged body.

(c) Place tube assembly in its installed position. Thread nut onto swaged body. Tighten nut just enough to support the tube.

(d) Assemble coupling at opposite end of tube assembly.

(e) Install tube support clamps.

(f) Tighten coupling nuts by hand until firmly seated.

(g) Install lock-wire between coupling and coupling body.

E. Disassembly of Wiggens Four-Seal Coupling

NOTE: Four-seal coupling assemblies, having fuel drain ports for the detection of faulty internal seals, are installed in the No. 1 and 3 engine fuel feed manifolds at the point the manifold enters the pylon, and in the No. 2 engine fuel feed manifold next to the firewall shutoff valves.

The following procedure disassembles the coupling to the extent necessary for removal of the tube assembly or component to either side of the coupling. Removal of one of these items is required in order to replace a faulty O-ring in the coupling.

(1) Verify that fuel manifold is drained.

(2) Remove lock-wire and separate coupling nut from body (Ref. Fig. 202).

(3) Slide body out of its installed position to expose internal parts.

(4) Remove retainer (two parts).

(5) Complete removal of tube assembly or component. (This task will involve removal of either a complete tube assembly or a component, possibly a fuel valve assembly, and disassembly of a second coupling.)

F. Assembly of Wiggens Four-Seal Coupling

(1) Install new coupling O-ring as follows:

(a) Remove first O-ring and discard (Ref. Fig. 202).

(b) Remove spacer using snap-ring pliers.

(c) Remove and discard second O-ring.

(d) Remove and replace split-washer and coupling nut on body, if replacement is required.

(e) Lubricate O-ring with specified grease and install.

(f) Install spacer using snap-ring pliers.

(g) Lubricate and install second O-ring.

R (h) Repeat Steps 3F(1)(a) through 3F(1)(g) on mating tube assembly or component adapter.

(i) Install removed tube assembly or component.

(j) Verify alignment of parts (Ref. Fig. 202).

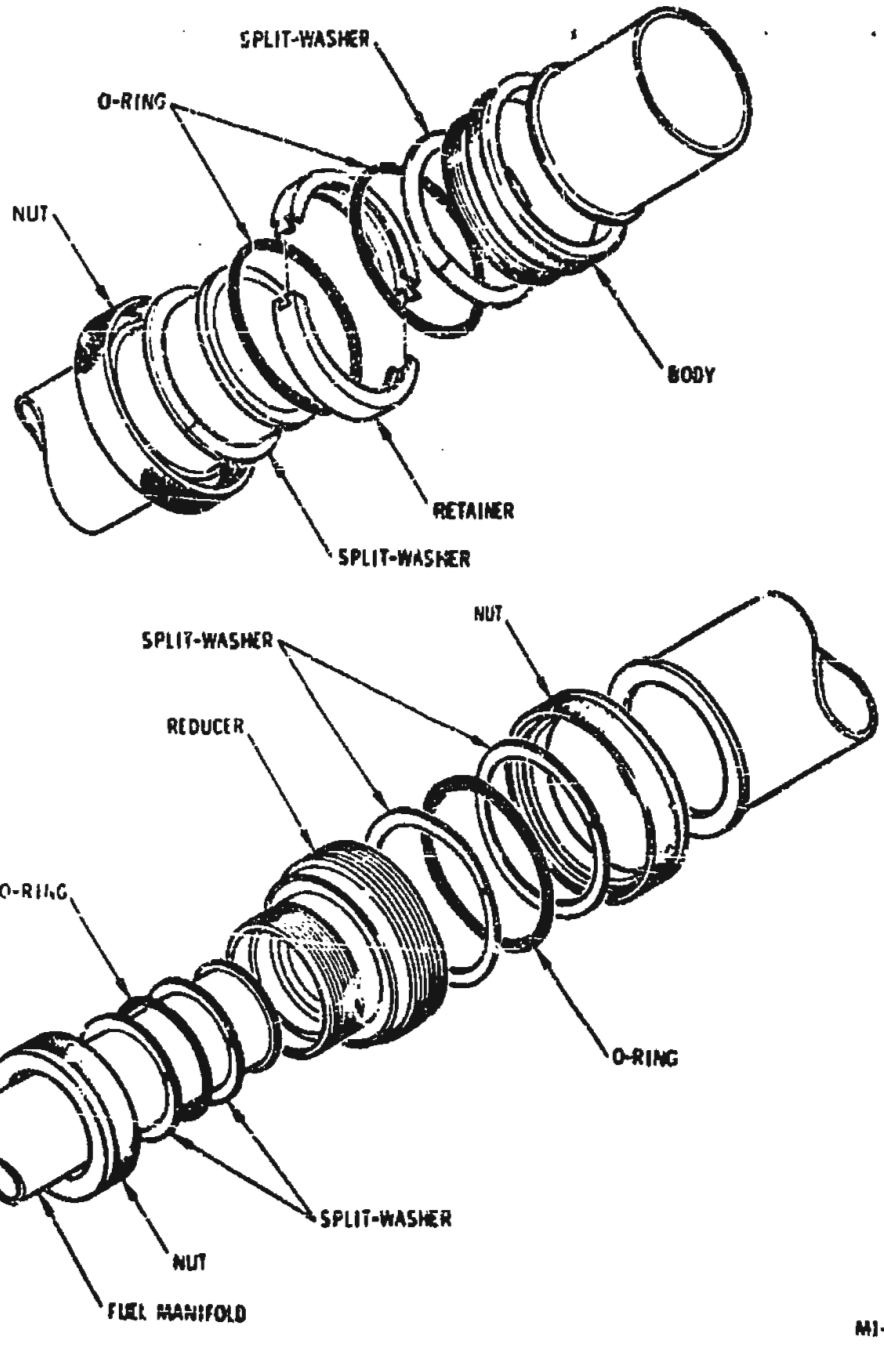
(k) Install two-part retainer.

(l) Slide all parts together against retainer and apply film of specified grease on external surfaces of stacked parts.

(m) Slide body into its installed position over the stacked parts.

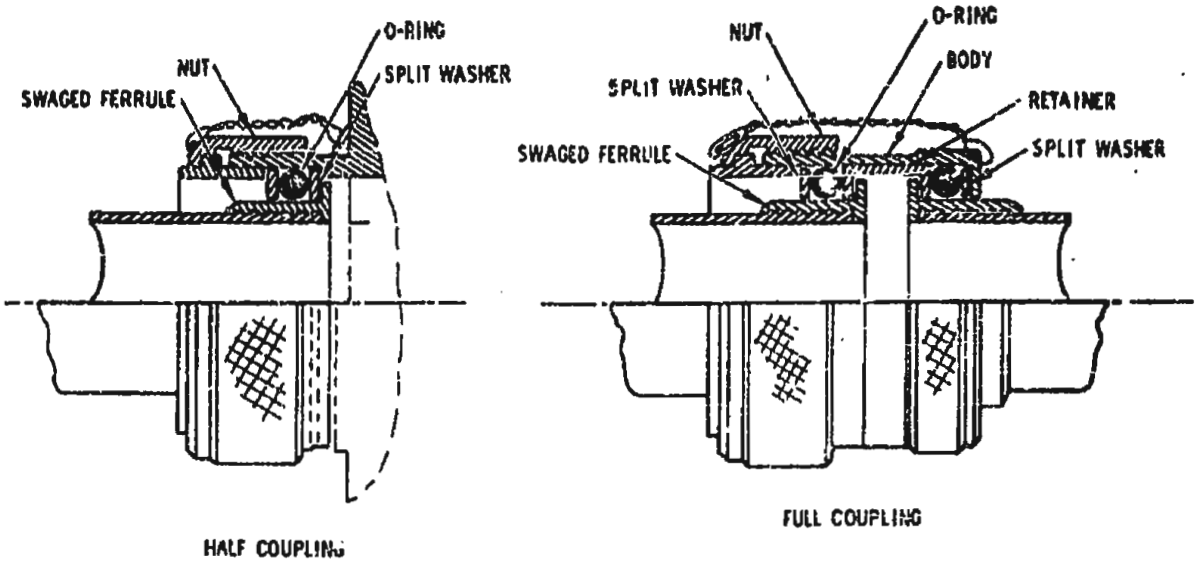
(n) Install coupling nut. Hand-tighten until firmly seated.

(o) Install lock-wire between nut and body. Bend lock-wire pigtail into contact with coupling.

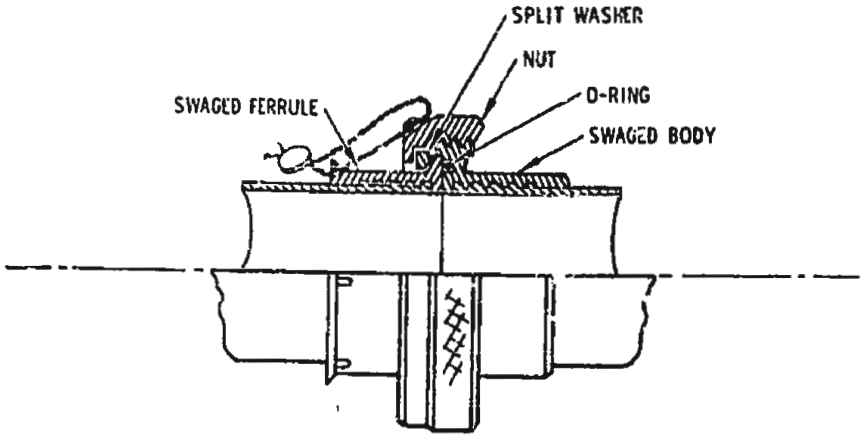


R Wig-O-Flex Couplings, Typical Installations
R Figure 201 (Sheet 1)

R EFFECTIVITY: ALL
R
0508



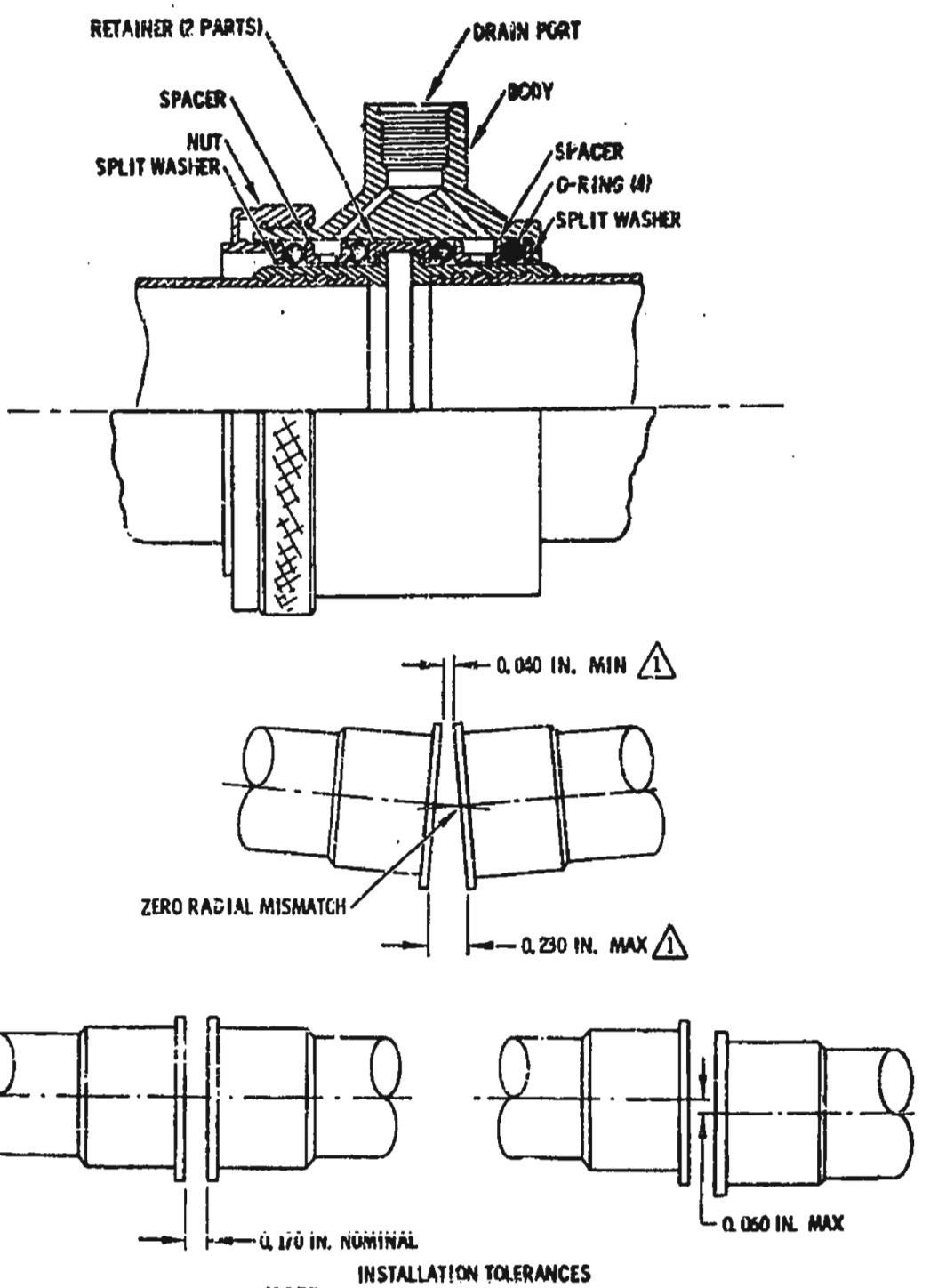
WIG-O-FLEX 6300 SERIES FLEXIBLE TUBE COUPLING



WIGGINS MIN-O-MAL TYPE 8300 SERIES RIGID TUBE COUPLING

M1-0001-28-220

R Wig-O-Flex Couplings, Typical Installations
R Figure 201 (Sheet 2)



MI-0002-28-221

R Wig-O-Flex Four Seal Coupling
R Figure 202

EFFECTIVITY: ALL

001B

PRESSURE FUELING SYSTEM - DESCRIPTION AND OPERATION

1. General

A pressure fueling system (Ref. Fig. 1) permits individual or simultaneous fueling of all fuel tanks through one or both dual port fueling hose adapters located in the right and left wing leading edge sections. Pressure fueling (and defueling) operations are controlled from a fueling/defueling panel located between the right wing fueling hose adapters (Ref. Fig. 2 and 3). Essentially all fuel distribution piping and manifolding used in pressure fueling the aircraft is also common to the defueling system (Ref. 28-22-00). Common elements are the fueling/defueling panel, a cross-ship fueling/defueling manifold, manifold isolation valve, fuel quantity indicating system (Ref. 28-41-00), fuel level sight gages, fueling defueling hose nozzle adapters, and electrical power distribution and selection circuits. Components primarily used for fueling only, are fueling valves and fuel level control switches for each tank, controls, switches, and indicating lights on the fueling/defueling panel, and associated electrical circuitry. Pressure fueling system components are listed in Table 1.

Pressure Fueling Components
Table 1

COMPONENT OR CONTROL	NO. UNITS	LOC	FUNCTION	DESCRIPTION
SET POINT TEST lights	4	Fueling/ defueling panel	Light on indicates fuel quantity in tank is below preset level	Jeweled indicator light (green)
Fuel quantity indicators	4	Fueling/ defueling panel	Indicates quantity of fuel in tanks	Analog/digital indicator with fuel quantity preset knob
VALVE CLOSED lights	6	Fueling/ defueling panel	When on, fueling valve is closed	Jeweled indicator lights (green)

Pressure Fueling Components (Cont)
Table 1

COMPONENT OR CONTROL	NO. UNITS	LOC	FUNCTION	DESCRIPTION
FUELING VALVES switches	6	Fueling/ defueling panel	Select fueling valve open/close position	DPDT toggle switch
FUEL SHUTOFF TEST switch	1	Fueling/ defueling panel	PRI position tests primary fuel level control switch circuit SEC position tests secondary fuel level control switch circuit	SPDT momentary contact toggle switch (center off position)
ISOLATION VALVE switch	1	Fueling/ defueling panel	Select manifold isolation valve open/close position	DPDT toggle switch (solenoid-held in ON position)
ISOLATION VALVE light	1	Fueling/ defueling panel	Light on indicates fueling/ defueling manifold isolation valve is in-transit or in disagreement with selected switch position	Jeweled indicator light (amber)
GAGES TEST switch	1	Fueling/ defueling panel	Tests indicator circuits	SPST toggle switch (OFF - Mom. ON)
LIGHTS-TEST switch	1	Fueling/ defueling panel	Tests panel indicator lights	4PST toggle switch (OFF - Mom. ON)

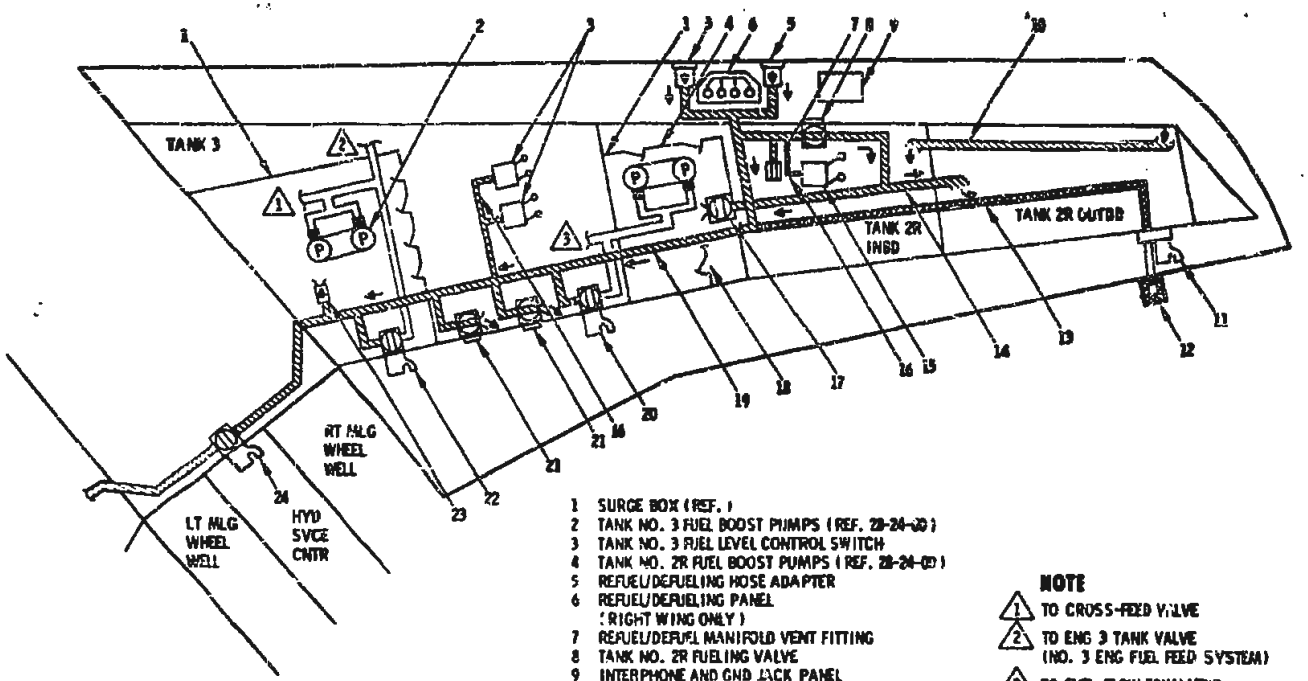
Pressure Fueling Components (Cont)
Table 1

COMPONENT OR CONTROL	NO. UNITS	LOC	FUNCTION	DESCRIPTION
SYSTEM POWER switch	1	Fueling/ defueling panel	ON position supplys power to fueling/ defueling circuits	DPDT toggle switch (solenoid held to ON)
REFUEL POWER switchlight	1	FE/SO FUEL SYSTEM panel	Light on indicates fueling/ defueling panel SYSTEM POWER switch is ON. Switchlight will release solenoid-held SYSTEM POWER switch.	DPDT Mom contact switchlight
REFUEL ALTN POWER RCCB	1	Mid Elec Service Center	Connects fueling/ defueling circuits to 28V DC BAT BUS	
REFUEL BYPASS relay	1	Flight Station Relay Panel	Permits readout of tank 2L and 2R inbd fuel quantities.	
FUELING VALVE FLT SW BYPASS switches	4	Left and right wing inter-phone jack panels	When closed, switch opens respective tank 2L or 2R fueling valve	DPDT toggle switch
REFUEL POWER relay	1	Mid Elec Service Center	Connects fueling/ defueling circuits to DC GND SVCE BUS EXT	

Pressure Fueling Components (Cont)
Table 1

COMPONENT OR CONTROL	NO. UNITS	LOC	FUNCTION	DESCRIPTION
REFUELING BUS XFER relay	1	Mid Elec Service Center	Controls switching of normal or alternate power to fueling/ defueling circuits	
Fueling valves	6	One in Tank 2L and 2R. Two in Tank 1 and 3	Controls fueling flow into tank	
Fuel level control	6	One in Tank 2L and 2R. Two in Tank 1 and 3.	Terminates fueling flow at full tank level	Float actuated switches
Fueling/defueling Manifold isolation valve	1	Hyd Service Center	Permits cross-ship fueling and defueling	
PRIMARY SOL TEST relay	1	Mid Elec Service Center	Connects 28V DC test power to fuel level control switch solenoids	
SECONDARY SOL TEST relay	1	Mid Elec Service Center	Connects 28V DC test power to fuel level control switch solenoids	

The aircraft is pressure fueled using either, or both, left and right wing fueling hose adapters. Fuel is admitted to tanks 1 and 3 through two electrically controlled, fuel pressure actuated fueling valves in each tank, and automatically terminated when the amount of fuel in the tank reaches the



1 SURGE BOX (REF.)
2 TANK NO. 3 FUEL BOOST PUMPS (REF. 28-24-00)
3 TANK NO. 3 FUEL LEVEL CONTROL SWITCH
4 TANK NO. 2R FUEL BOOST PUMPS (REF. 28-24-00)
5 REFUEL/DEFUELING HOSE ADAPTER
6 REFUEL/DEFUELING PANEL (RIGHT WING ONLY)
7 REFUEL/DEFUEL MANIFOLD VENT FITTING
8 TANK NO. 2R FUELING VALVE
9 INTERPHONE AND GND JACK PANEL (FUEL LEVEL CONTROL BYPASS SWITCHES)
10 HIGH-LEVEL FUEL TRANSFER MANIFOLD
11 FUEL JETTISON VALVE (REF. 28-31-00)
12 FLAME ARRESTOR (REF. 28-31-00)
13 FUEL JETTISON MANIFOLD (REF. 28-31-00)
14 LOW-LEVEL FUEL TRANSFER MANIFOLD
15 TANK NO. 2R FUEL LEVEL CONTROL SWITCH
16 PRECHECK FUEL PRESSURE (TO FUEL LEVEL CONTROL SWITCH ASSY)
17 FUEL TRANSFER VALVE (FLOAT ACTUATED, REF. 28-27-00)
18 FLAPPER CHECK VALVE (TYP) (REF. 28-11-00)
19 REFUEL/DEFUEL MANIFOLD
20 TANK NO. 2R PUMP-DEFUELING VALVE (REF. 28-22-00)
21 TANK NO. 3 FUELING VALVE (REF. 28-21-00)
22 TANK NO. 3 PUMP-DEFUELING VALVE (REF. 28-22-00)
23 REFUEL/DEFUEL MANIFOLD DRAIN VALVE
24 REFUEL/DEFUEL MANIFOLD ISOLATION VALVE

NOTE

1. TO CROSS-FEED VALVE
2. TO ENG 3 TANK VALVE (NO. 3 ENG FUEL FEED SYSTEM)
3. TO FUEL FLOW EQUALIZER (NO. 2 ENG FUEL FEED SYSTEM, REF. 28-24-00)

(4) RIGHT WING SHOWN - LEFT WING IDENTICAL EXCEPT FOR TANK 2R AND 3 COMPONENT NOMENCLATURE

(5) FUELING VALVES ARE SHOWN OPEN

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R Pressure Fueling System Diagram
R Figure 1

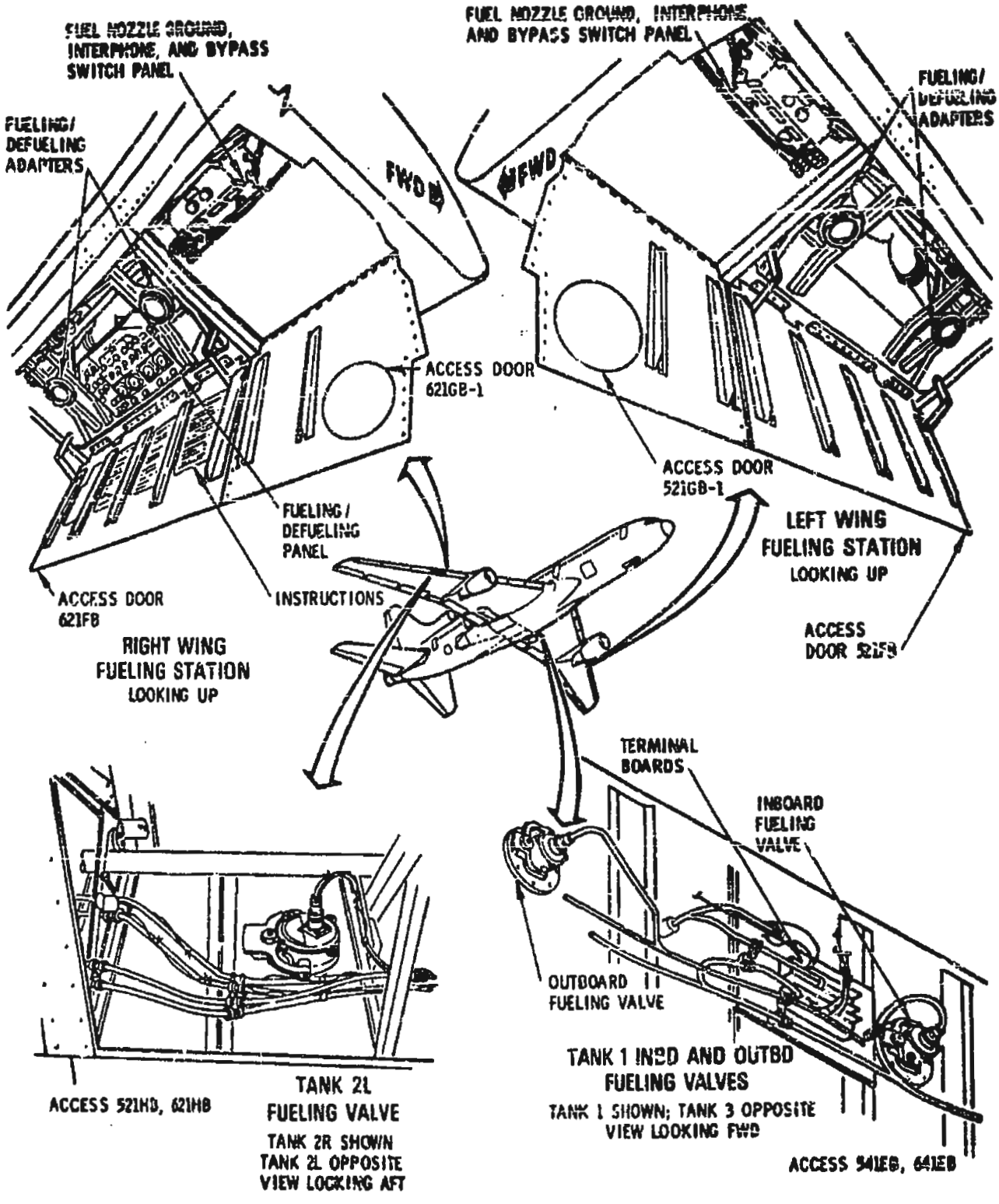
R EFFECTIVITY: 001-024, 027

quantity selected on the respective tank fueling/defueling panel gage. Fuel cutoff is indicated when the respective tank fueling
R valve VALVE CLOSED light on the panel comes on. Tanks 2L and 2R are refueled through a single electrically controlled, fuel pressure actuated fueling valve which admits fuel to the outboard section of the tank. The initial amount of fuel pumped into the tank flows into the inboard section surge box through a low-level fuel transfer manifold and float actuated fuel transfer valve. When the surge box fuel level rises high enough to close the float actuated valve, the outboard section will fill. The inboard tank fuel level will remain at this level until the outboard tank level is high enough for fuel to flow once again into the inboard section through a high-level fuel transfer manifold. Refueling flow is terminated when the total amount of fuel in both tank sections reaches the quantity selected on the respective fueling/defueling panel gage. As in tank 1 and 3, fuel cutoff is indicated when the respective tank
R fueling valve VALVE CLOSED light comes on.

The maximum amount of fuel admitted to the wing tanks is controlled by high-level fuel control units containing float actuated switches which electrically close the fueling valves.

An interphone and fuel nozzle ground jack panel containing a tank 2R fuel level control unit bypass switch is located just outboard of the fueling/defueling panel. A similar bypass switch for the tank 2L fuel level control unit is mounted on an interphone and fuel nozzle ground jack panel just outboard of the fueling hose adapters in the left wing.

Pressure fueling (and defueling) operations are conducted from the fueling/defueling panel. The panel contains control switches, indicating lights, and fuel quantity indicators necessary for fueling (and defueling) the aircraft. Individual control switches and valve position indicating lights are provided for each fueling valve. A control switch is also provided for opening the cross-ship fueling/defueling manifold isolation valve when a tank is fueled (or defueled) using only the fueling hose adapters in the opposite wing. Provisions are incorporated for presetting the amount of fuel desired in each tank. The amount of fuel desired is selected by adjusting an index (bug) on the respective tank fuel quantity indicator dial to the required fuel reading. The tank fueling valve is automatically closed and fueling flow terminated when the indicator pointer has rotated upscale to the indexed reading. The exact point of fuel cutoff is indicated when a light next to the indicator goes out. The system also automatically terminates fueling at the full tank level. This function is checked during the fueling operation by fuel shutoff test provisions built into the fuel level control switch assemblies and fueling valves, and controlled by a FUEL SHUT-OFF TEST test switch on the panel.


FUEL NOZZLE GROUND, INTERPHONE, AND BYPASS SWITCH PANEL
FUELING/ DEFUELING ADAPTERS
FWD
ACCESS DOOR 621GB-1
FUELING/ DEFUELING PANEL
INSTRUCTIONS
ACCESS DOOR 621FB
RIGHT WING FUELING STATION LOOKING UP
FUEL NOZZLE GROUND, INTERPHONE AND BYPASS SWITCH PANEL
FUELING/ DEFUELING ADAPTERS
FWD
ACCESS DOOR 521GB-1
LEFT WING FUELING STATION LOOKING UP
ACCESS DOOR 521FB
TERMINAL BOARDS
INBOARD FUELING VALVE
OUTBOARD FUELING VALVE
TANK 1 INBD AND OUTBD FUELING VALVES
TANK 1 SHOWN; TANK 3 OPPOSITE VIEW LOOKING FWD
ACCESS 541EB, 641EB
ACCESS 521HB, 621HB
TANK 2L FUELING VALVE
TANK 2R SHOWN TANK 2L OPPOSITE VIEW LOOKING AFT
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R
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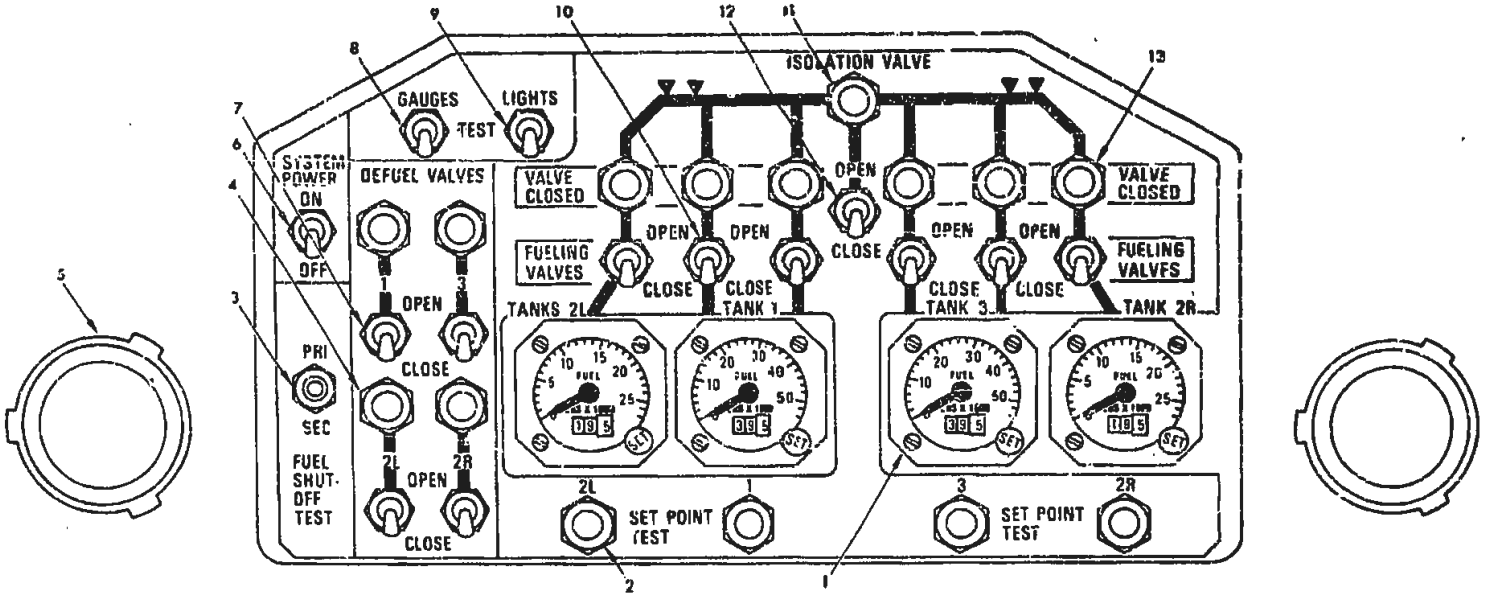
Fueling System Components
Figure 2

EFFECTIVITY: 001-024, 027



1 FUEL QUANTITY INDICATOR (4 PLACES)

- PROVIDES DIGITAL AND ANALOG INDICATION OF FUEL QUANTITY
- INCORPORATES SET POINT INDEX TO PERMIT SELECTION OF DESIRED FUEL QUANTITY. REFUELING IS AUTOMATICALLY TERMINATED WHEN INDICATOR POINTER REACHES INDEX SETTING. TERMINATION OF FUEL FLOW INTO TANK IS INDICATED WHEN CORRESPONDING SET POINT TEST LIGHT GOES OUT AND VALVE CLOSED LIGHT(S) COMES ON

2 SET POINT TEST LIGHT (4 PLACES)

- PROVIDES INDICATION OF AUTOMATIC SHUTOFF OF REFUELING FLOW. LIGHT GOES OUT WHEN INDICATOR POINTER PASSES SET POINT INDEX

3 FUEL SHUTOFF TEST SWITCH

- SWITCH IS DOUBLE-POLE DOUBLE-THROW MOMENTARY CONTACT TYPE WITH CENTER OFF POSITION
- PRIMARY AND SECONDARY POSITIONS SIMULATE FULL TANK CONDITION TO TEST AUTOMATIC FUEL SHUTOFF OPERATION. THE TEST VERIFIES OPERATION OF THE PRIMARY AND SECONDARY PILOT VALVES IN THE FUELING VALVES AND PRIMARY AND SECONDARY SWITCHES IN THE CORRESPONDING FUEL LEVEL CONTROL SWITCHES
- PROPER TEST RESULT IS INDICATED BY ALL VALVE CLOSED LIGHTS COMING ON

4 DEFUEL VALVES LIGHT (4 PLACES)

- LIGHT NORMALLY BLINKS ON, THEN OFF, WHEN VALVE IS IN-TRANSIT TO OPEN OR CLOSED POSITION. IF ON STEADY, VALVE IS NOT IN AGREEMENT WITH SWITCH POSITION

5 REFUEL/DEFUELING NOZZLE ADAPTER (2 PLACES)

- INCORPORATES PROVISIONS FOR ATTACHING STANDARD FUEL HOSE NOZZLES. TWO ADAPTERS ALSO LOCATED IN LEFT WING
- NOZZLE ATTACHMENT FLANGE IS DESIGNED TO BREAKAWAY IF PRE-DETERMINED CRITICAL FORCE IS APPLIED TO ADAPTERS THROUGH FUELING HOSES
- BROKEN NOZZLE ATTACHMENT FLANGES CAN BE REPLACED WITHOUT DISASSEMBLY. INTERNAL SPRING LOADED POPPET CLOSES ADAPTER PORT
- TWO REFUEL/DEFUELING NOZZLE ADAPTERS ARE ALSO LOCATED IN LEFT WING LEADING EDGE, ZONE 621 FB

6 SYSTEM POWER SWITCH

- CONTROLS APPLICATION OF ELECTRICAL POWER TO REFUEL/DEFUELING SYSTEM
- WHEN THE SWITCH IS ELECTRICALLY LATCHED IN ON POSITION, SERVICE PANEL LIGHTS COME ON, FUEL QUANTITY INDICATORS ARE POWERED, FUEL SHUTOFF TEST CIRCUIT IS ARMED, VALVE CLOSED INDICATOR LIGHTS COME ON, AND REFUEL POWER SWITCHLIGHT ON FLIGHT ENGINEER/SECOND OFFICERS FUEL SYSTEM PANEL COMES ON
- IF INADVERTENTLY LEFT ON, SYSTEM POWER SWITCH CAN BE UNLATCHED TO OFF POSITION BY DEPRESSING REFUEL POWER SWITCHLIGHT

7 DEFUEL VALVES SWITCH (4 PLACES)

- OPENS OR CLOSES DEFUELING VALVES

8 GAUGES TEST SWITCH

- WHEN HELD IN POSITION, SWITCH CHECKS OPERATION OF FUEL QUANTITY INDICATORS
- ALL FUEL QUANTITY INDICATORS DRIVE FULL UPSCALE
- CORRESPONDING SET POINT LIGHTS GO OUT
- ANY FUELING VALVE THAT IS OPEN WILL CLOSE
- SWITCH OPERATES IN PARALLEL WITH QTY TEST SWITCH ON FLIGHT ENGINEER/SECOND OFFICERS FUEL SYSTEM PANEL

9 INDICATOR LIGHTS TEST SWITCH

- TEST ON PANEL INDICATOR LIGHTS. ANY LIGHT NOT ALREADY ON WILL COME ON WHEN SWITCH IS HELD IN TEST POSITION

10 FUELING VALVE CONTROL SWITCH (6 PLACES)

- ARMS FUELING VALVE CIRCUIT FOR OPEN OPERATION
- FUEL PRESSURE IS REQUIRED TO OPEN FUELING VALVE

11 ISOLATION VALVE LIGHT

- LIGHT NORMALLY BLINKS ON, THEN OFF, WHEN VALVE IS IN-TRANSIT TO OPEN OR CLOSED POSITION. IF ON STEADY, VALVE IS NOT IN AGREEMENT WITH SWITCH POSITION

12 ISOLATION VALVE SWITCH

- OPENS REFUEL/DEFUELING MANIFOLD ISOLATION VALVE TO PERMIT REFUEL/DEFUELING OF ALL TANKS THROUGH ADAPTERS IN ONE WING ONLY
- PERMITS CROSS-SHIP TRANSFER OF FUEL BY MAINTENANCE PERSONNEL

13 FUELING VALVE POSITION LIGHT (6 PLACES)

- LIGHT IS ON WHEN CORRESPONDING FUELING VALVE IS CLOSED

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Fueling/Defueling Panel
Figure 3

3. Fueling/Defueling Hose Adapter

A. Description and Operation

Two fueling/defueling hose adapters (Ref. Fig. 4) are located in each wing leading edge section at the fueling/defueling stations. Each adapter assembly consists of an elbow-shaped housing, a spring-loaded poppet check valve, a protective cap, and a bayonet flange which will accept and retain a standard fueling/defueling hose nozzle. The bayonet flange is designed to break away to prevent damaging the adapter assembly if a force exceeding a predetermined level is inadvertently applied to the fueling/defueling hose. The bayonet flange is easily replaced without disassembly of the adapter, a spring-loaded poppet check valve prevents loss of fuel from the fueling/defueling manifold. A spring-loaded seal in the cap prevents passage of fuel into the wing leading edge if seepage occurs past the poppet check valve.

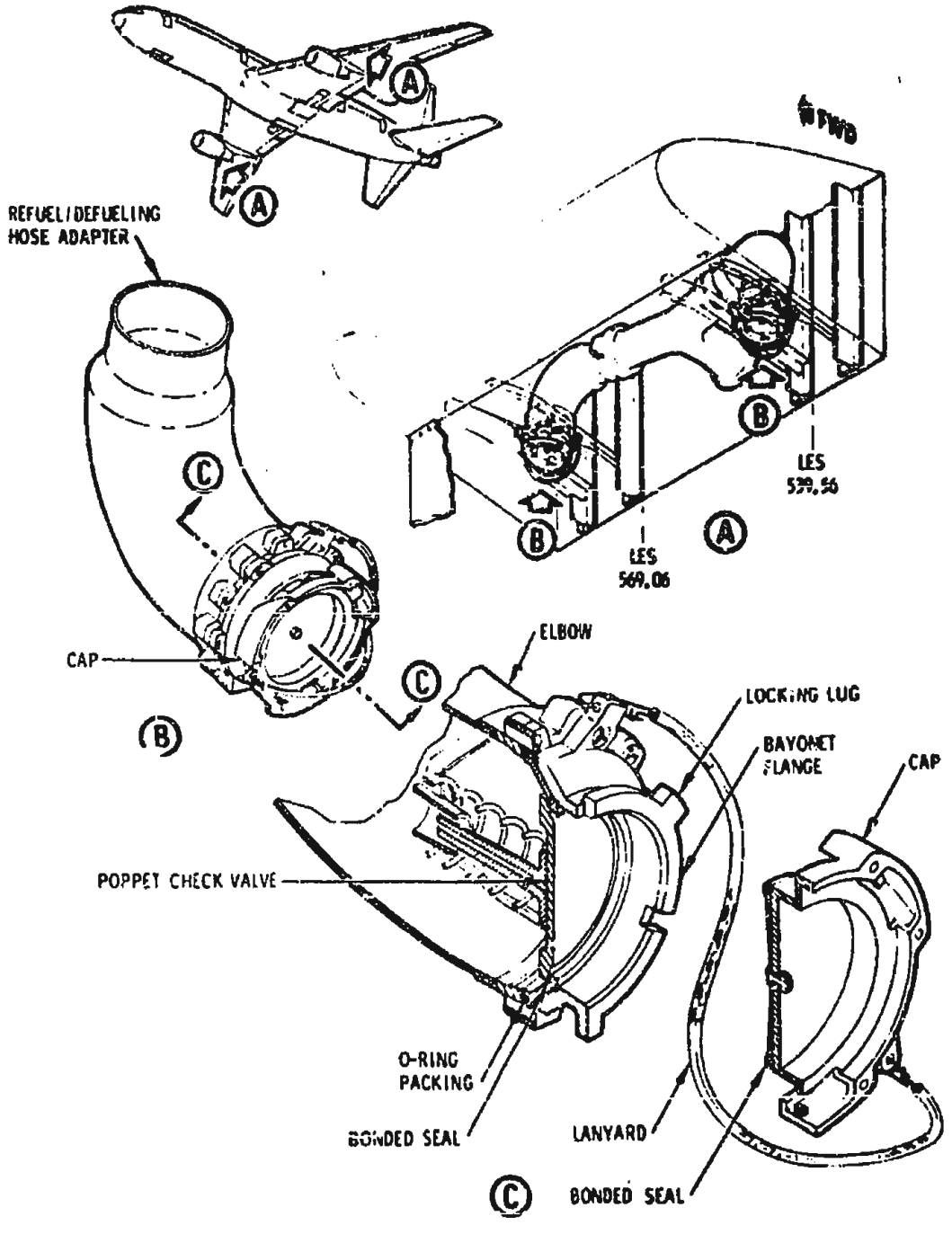
4. Fuel Level Control Switches

A. Description and Operation

Six identical fuel level control switch assemblies, two each in tank 1 and 3 and one each in tank 2L and 2R (Ref. Fig. 5, 6) operate in conjunction with the fueling valves (Ref. Fig. 7) to automatically terminate fueling at full tank levels. Basic components in the assemblies are two float chambers, two float operated primary and secondary magnetically actuated switches, primary and secondary test solenoids and precheck poppets, and the switch body. Provisions are incorporated in the body for the attachment of an electrical wiring conduit and a fuel pressure sensing line. Wiring in the unit is isolated from fuel by potting compound and routed to the two switches and solenoids through internal passages in the switch assembly body. Both switches and solenoids are encapsulated. The switches are vertically mounted in the float chambers and surrounded by the floats. They are normally closed. In operation, fuel entering the float chambers causes the floats to rise and magnetically open the switches.

R On aircraft 001-014 with SB28-008, 027 and 015-024, a lock-wired and lead-sealed fitting in the precheck fuel inlet port houses a mesh screen. The screen is normally removed for inspection in the overhaul shop.

During fueling, the float switches may be individually tested by placing the FUEL SHUT-OFF TEST switch, on the fueling/defueling control panel, to primary and secondary



Fueling/Defueling Hose Adapter
Figure 4

positions. Placing the test switch to the PRI position energizes the primary solenoid. This opens a poppet and admits fuel from the fueling/defueling manifold to the primary float switch chamber through a precheck port. The float rises and opens the switch. Opening of the switch is indicated by closing of the fueling valve and appearance of a VALVE CLOSED light on the panel. Placing the test switch to the OFF position deenergizes the solenoid and closes the poppet. Fuel drains from the float chamber and the falling float permits the switch to close and the fueling valve to open. The secondary float switch is tested in the same manner by placing the test switch to the SEC position.

R Tank 2L and 2R fuel level control unit bypass switches are
R installed on the interphone and fuel nozzle ground panels
P next to the fuel hose adapters in each wing. They are wired
R in parallel with the respective tank float actuated fuel
R level control unit switches.

These switches are primarily maintenance aids used to open the fueling valve if a malfunctioning switch prevents opening of the valve.

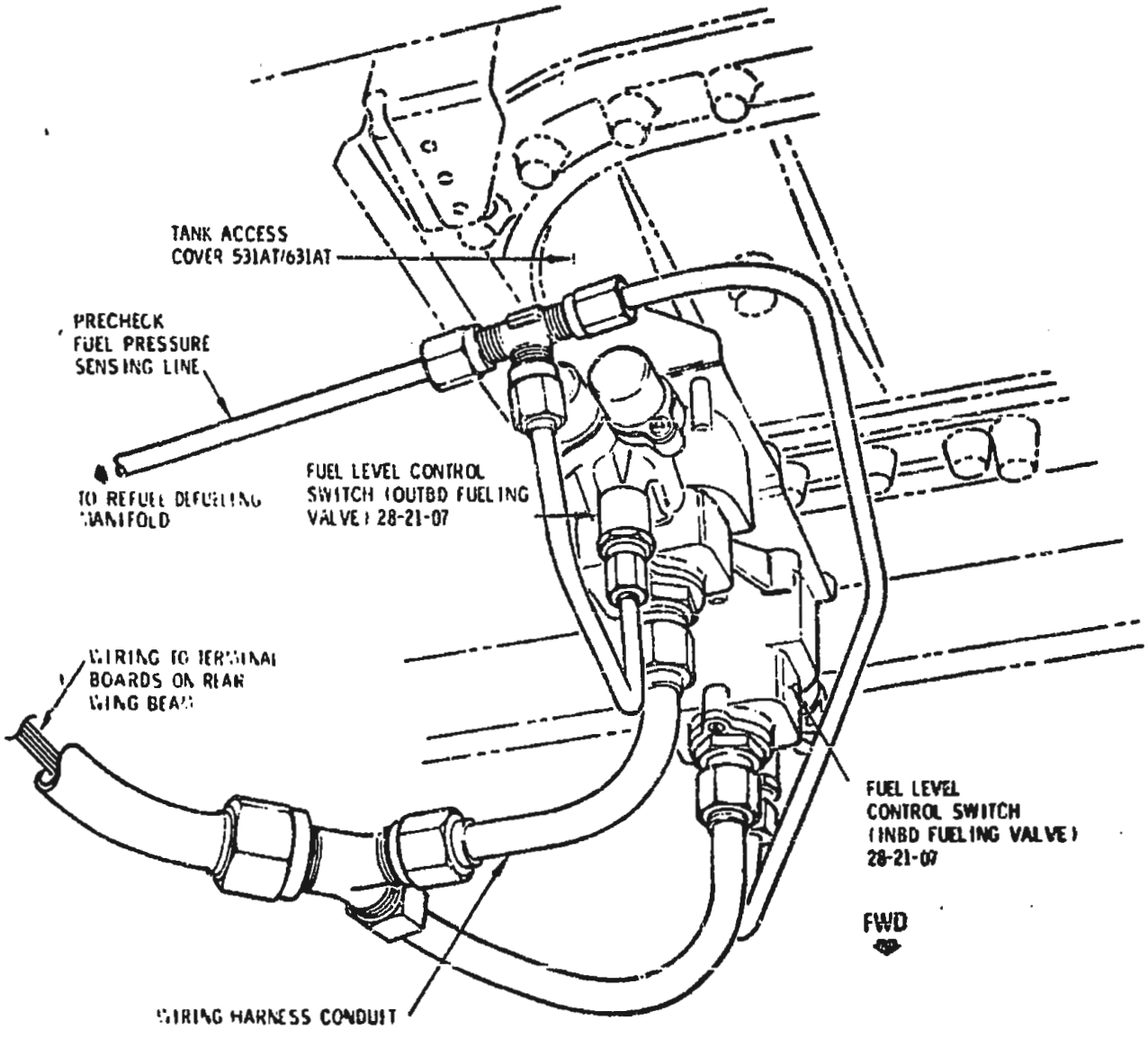
5. Fueling Valves

A. Description and Operation

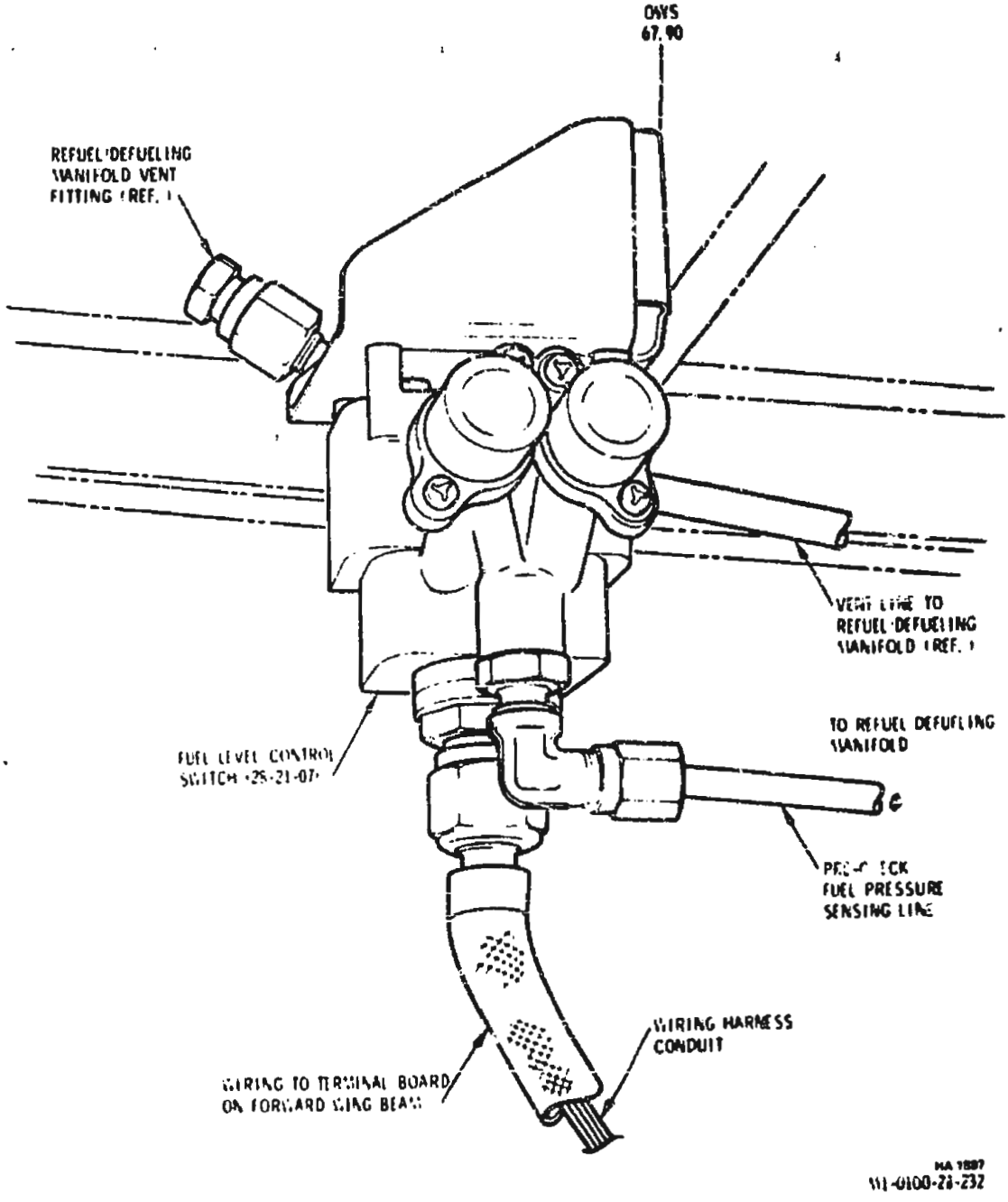
Electrically controlled, fuel pressure actuated fueling valves (Ref. Fig. 7) control the flow of fuel into each tank from the fueling/defueling tank interconnect manifold. One fueling valve for tank 2L and one for tank 2R is mounted on the wing forward spar at outer wing stations 67.90. Two tank 1 and two tank 3 fueling valves are mounted on the wing rear spars at inner wing stations 387.17 and 406.00.

Primary valve components are a valve housing and a line replaceable plug-in module. Valve housings are mounted on the wing spars inside the tank with fuel inlet and outlet ports connected to the refuel/defueling manifold by WIG-O-FLEX couplings and are considered components of the permanently installed fuel distribution piping. Plug-in modules are interchangeable line-replaceable units. When the plug-in module is removed, a circular sleeve within the housing is rotated to shut off the housing fuel inlet and outlet ports. Module replacement is thus accomplished without defueling or entering the tank.

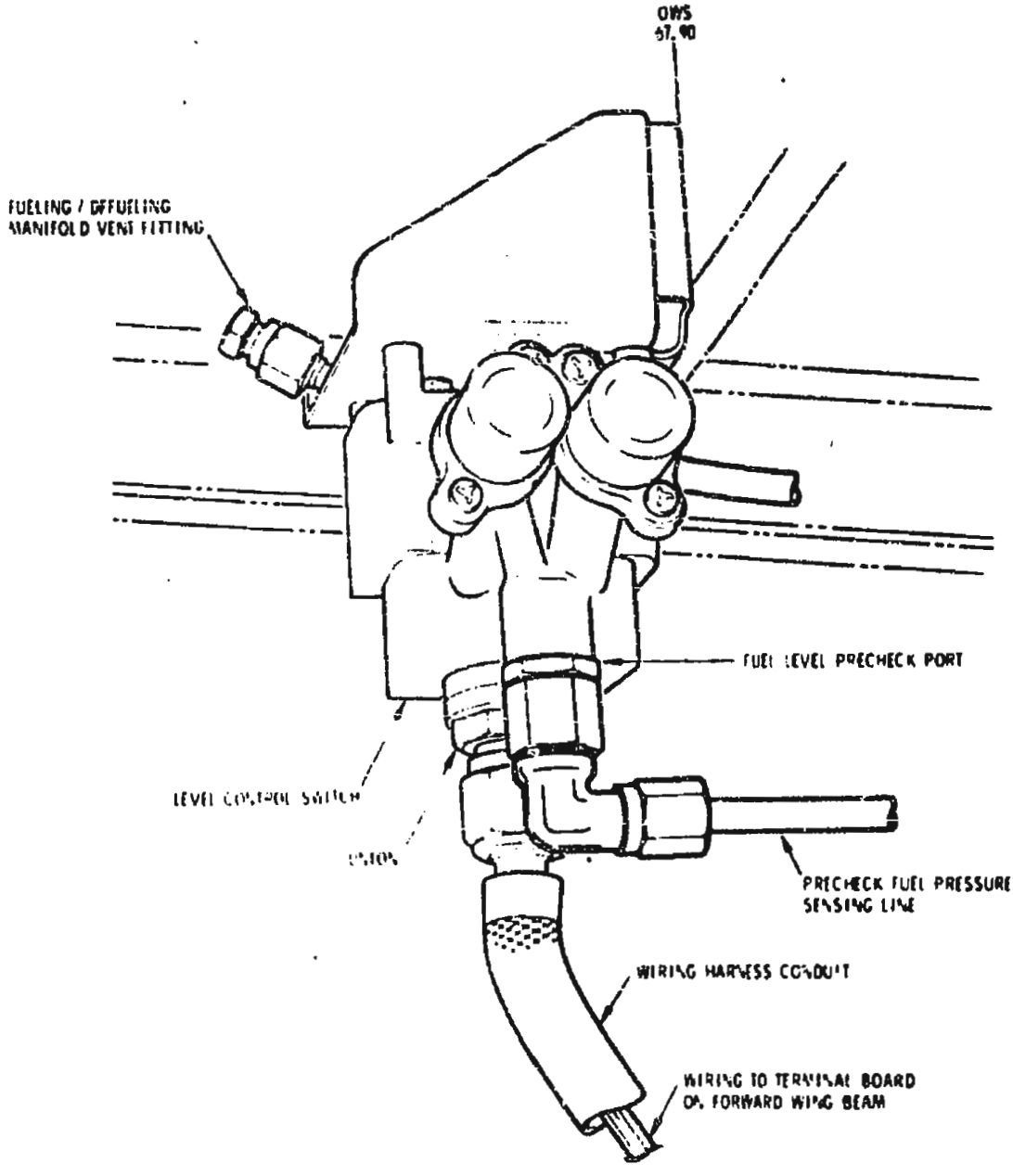
Other than the housing sleeve, all operating parts of the valve assembly are contained in the plug-in module. These parts include primary and secondary poppets and solenoids, primary and secondary diaphragm valves, valve body, primary


TANK ACCESS COVER 531AT/631AT
PRECHECK FUEL PRESSURE SENSING LINE
TO REFUEL DEFUELING MANIFOLD
FUEL LEVEL CONTROL SWITCH (OUTBD FUELING VALVE) 28-21-07
WIRING TO TERMINAL BOARDS ON REAR WING BEAM
FUEL LEVEL CONTROL SWITCH (INBD FUELING VALVE) 28-21-07
FWD
WIRING HARNESS CONDUIT
M1-0105-28-030

Fuel Level Control Switches, Tank 1 and 3
Figure 5



Fuel Level Control Switch, Tank 2L and 2R
Figure 6



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Fuel Level Control Switch, Tank 2L and 2R
Figure 6

R EFFECTIVITY: 001-014 WITH SB28-008, AND
R 015-024, 027

and secondary metering pins, thermal relief valves, a reverse pressure check valve, and a capsule containing three solid state relays. The valve operates in conjunction with its corresponding fuel level control switch assembly. The primary and secondary float actuated switches in the fuel control switch assembly act as logic on/off gates for the solid state relays in the valve. When closed, the gates provide a ground for the solid state relay control circuits. Application of 28V dc power, when the FUELING VALVES switch on the fueling/defueling panel is placed in the OPEN position, electronically closes the relay and energizes the ball valve poppet solenoids. This unseats the poppets and allows fuel to bleed off from the back side of the primary and secondary valve diaphragm. Inlet fuel pressure acting against the front side of the diaphragms opens the valves and fuel flows through the valve into the tank. The VALVE CLOSED light on the fueling/defueling panel goes out as described under FUEL LEVEL CONTROL SWITCHES.

At the full tank level, fuel enters the fuel level control switch assembly. The rising floats magnetically open the fuel control gates which removes the ground from the solid state relay control circuits. The relays electronically open and the poppet control solenoids deenergize. The spring loaded poppets close. Inlet fuel pressure, admitted to the back side of the primary diaphragm through the primary pickup orifice, and to the back side of the secondary diaphragm through the reverse pressure check valve, builds up until fluid pressure across the diaphragm is equalized. The differential pressure created by the springs on the diaphragms closes the valves, and the fuel flow is shut off. The VALVE CLOSED light on the fueling/defueling panel comes on as described under FUEL LEVEL CONTROL SWITCHES.

6. Manifold Vent Fitting

A. Description and Operation

In tank No. 2L and 2R, a line is routed from the fueling/defueling manifold to the vented airspace next to the fuel level control switches. The line is terminated in a vent fitting (Ref. Fig. 6) comprised of a standard MS type plug having a 0.040-inch diameter orifice. The fitting provides sufficient venting of the manifold (when unpressurized) to permit fuel to drain into tanks 1 and 3 through the manifold drain valve (Ref. 28-23-00).

7. Manifold Isolation Valve

The manifold isolation valve is an actuator-driven butterfly valve. It is located in the fueling/defueling manifold in the wing center section box (Ref. Fig. 8).

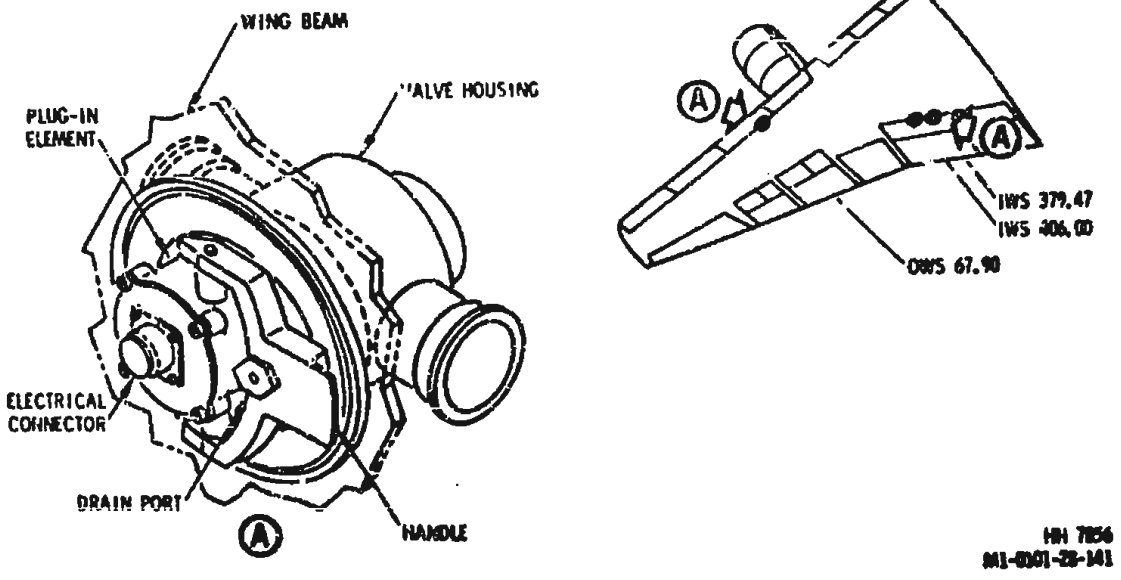
The valve actuator is accessible from the hydraulic service center, zone 147. When opened, the valve permits cross-ship refueling and transfer of fuel to tanks in the opposite wing. The valve is also opened during fuel jettison (Ref. 28-31-00).

The actuator contains a 28V dc reversible motor and gear train. Limit switches restrict motor operation to the valve open and closed positions. An external disagreement light is turned on whenever the actuator position does not agree with the command switch position. A relay is also included to prevent motor operation when power is applied to both the open and close coils at the same time.

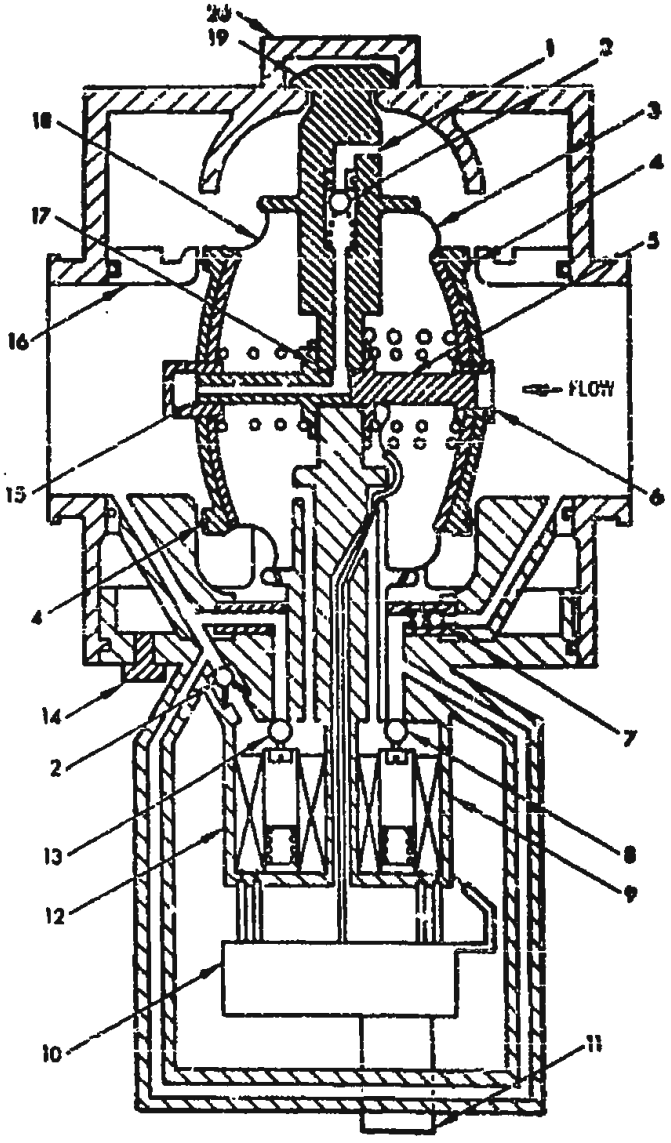
8. System Operation

A. Fueling Power

Two sources of 28V dc power available for operation of the pressure fueling system are automatically selected by a

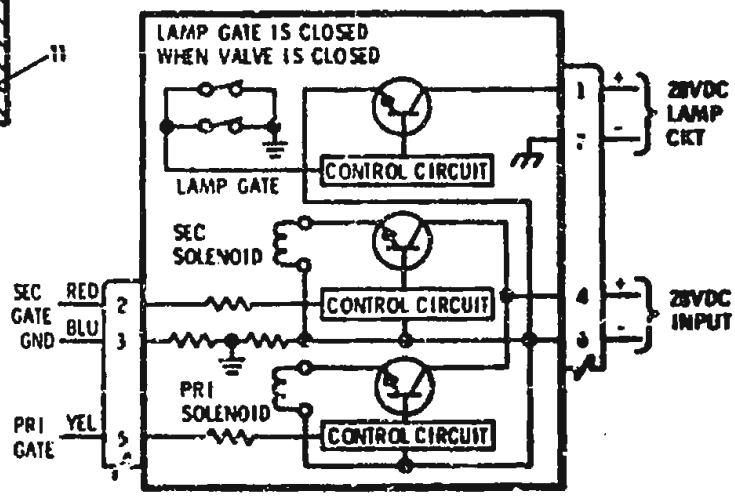


Fueling Valve
Figure 7 (Sheet 1)



INDEX

1 SECONDARY PICKUP ORIFICE
2 REVERSE PRESSURE CHECK VALVE
3 PRIMARY DIAPHGRAM
4 POPPET GATE (LAMP ELEC CIRCUIT)
5 PRIMARY METERING PIN
6 PRIMARY PICKUP ORIFICE
7 THERMAL RELIEF VALVE
8 PRIMARY POPPET
9 PRIMARY SOLENOID
10 SOLID STATE RELAY CAPSULE
11 ELECTRICAL CONNECTOR
12 SECONDARY SOLENOID
13 SECONDARY POPPET
14 DRAIN PLUG
15 SECONDARY METERING PIN
16 HOUSING PORT SLEEVE
17 INSULATOR
18 SECONDARY DIAPHRAGM
19 RETAINING BAYONET
20 HOUSING



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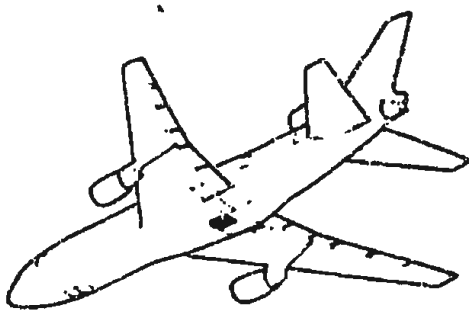
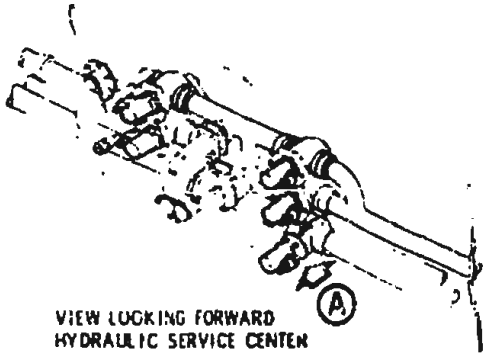
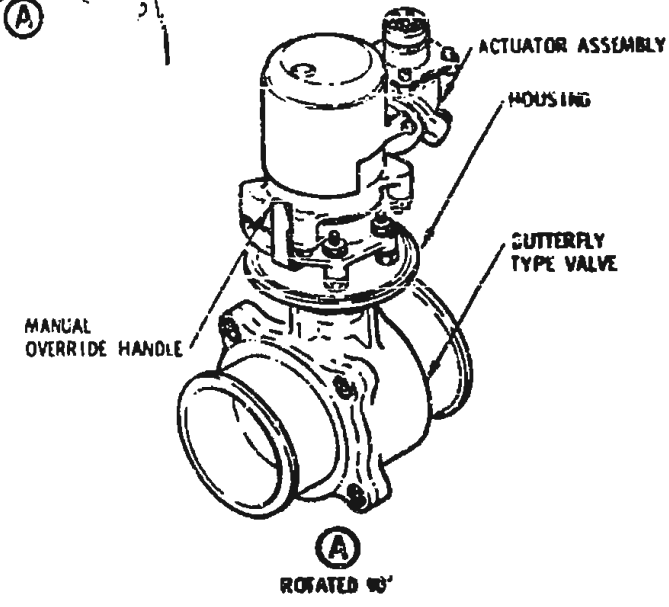
Fueling Valve
Figure 7 (Sheet 2)







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Manifold Isolation Valve
Figure 8

power seeking circuit when the fueling/defueling panel SYSTEM POWER switch is in the ON position (Ref. Fig. 3 and 9). Normal power is acquired from the dc ground service bus extension. Alternate power is obtained from the BAT BUS and is automatically applied when there is no power at the dc ground service bus extension.

If power is available at the dc ground service bus extension when the SYSTEM POWER switch is placed in the ON position, the refueling bus transfer relay will be energized and normal dc power will be applied to the system. If normal power is not available, the refueling bus transfer relay will remain deenergized and alternate power will be applied through the normally closed contacts of the relay.

The 115V ac power required for fuel quantity indicating system and FE/SO panel fuel quantity indicators is acquired directly from the FWD AC GND SVCE BUS. Fueling/defueling panel gages acquire 115V ac power from the PASSENGER SVCE BUS 1B ØA bus through energized contacts of FUELING BUS XFER relay (2821-K1) when the panel SYSTEM POWER switch is latched on.

If ac power is not available, the fuel quantity indicating system gages, and automatic full tank fuel shutoff circuitry, will be inoperative. Under these conditions, the aircraft may still be pressure fueled using BAT BUS power and the alternate power circuitry. The amount of fuel pumped into the aircraft tanks must be closely monitored using the fuel tank sight gage sticks and refueling source fuel flow gages.

R On aircraft 001-024, 027 with SB28-056,
R 115V ac power is applied to the fueling/defueling panel
R gages whenever the phase A PASS SVCE BUS is energized.

Operation of the pressure fueling system is normally preceded by external grounding of the aircraft and fueling equipment, connection of hoses from the fuel supply truck(s) to the fueling hose adapters, adjustment of the fueling/defueling panel fuel quantity indicator set point indexes, and verification that the following circuit breakers are closed:

Galley Left Circuit Breaker Panel

DC BUS - PWR REFUELING

Galley Right Circuit Breaker Panel

FUEL - SYS GA RPTR IND

REFUEL - ALTN POWER

DEFUELING CONTROL PWR

FUELING - VALVE TEST

FUELING - VALVES

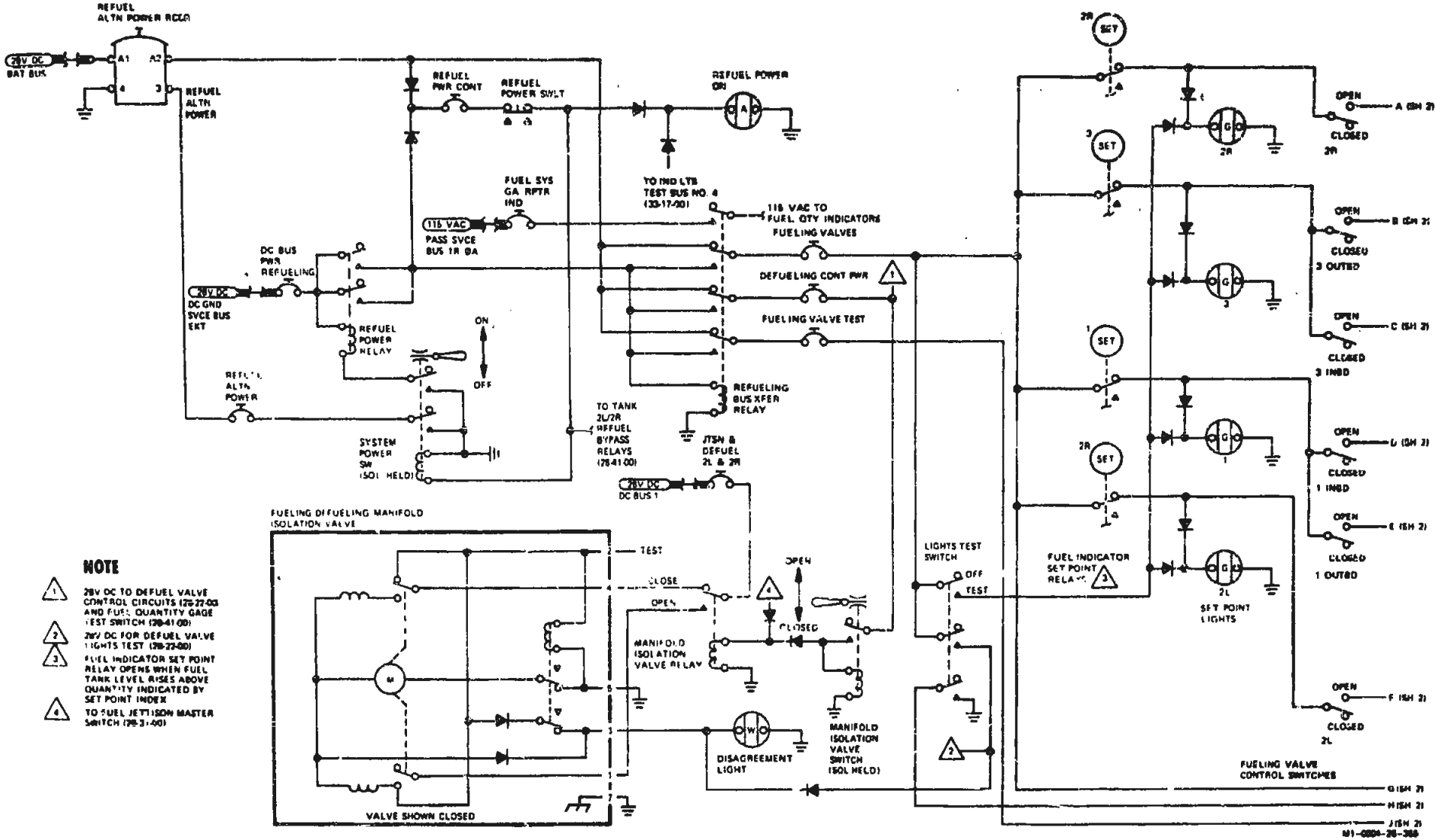
Flight Engineer/Second Officers aft circuit breaker panel CB3

JTSN & DEFUEL 2L & 2R

B. Normal Power Operation

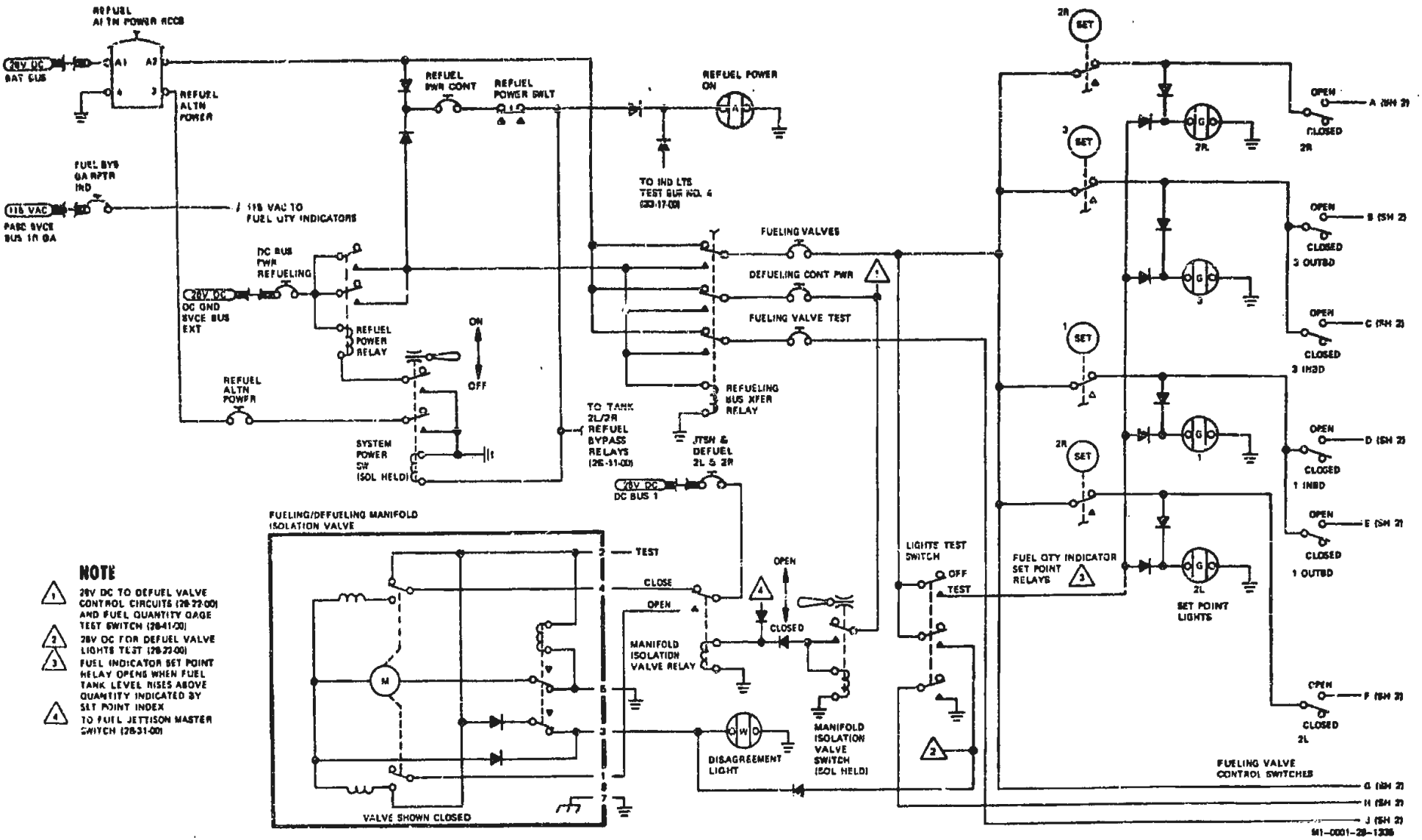
Fueling and defueling systems do not have electrical power until the SYSTEM POWER switch on the fueling/defueling panel is placed in the ON position (Ref. Fig. 10). Placing the SYSTEM POWER switch ON energizes the REFUEL POWER relay and applies 28V dc power from the DC GND SVCE BUS EXT through the relay contacts to the REFUEL PWR CONT circuit breaker. The SYSTEM POWER switch is electrically latched in the ON position by a circuit completed through the REFUEL PWR CONT circuit breaker and REFUEL POWER switchlight to a solenoid in the switch. At the same time the refueling bus transfer relay is energized making dc power available at the DEFUELING CONTROL PWR, FUELING VALVES, and FUELING VALVE TEST circuit breakers. Routing of the SYSTEM POWER switch solenoid hold circuit through the REFUEL POWER switchlight provides the Flight Engineer/Second Officer with the capability of breaking the SYSTEM POWER switch solenoid hold circuit and removing power from the fueling/defueling panel if the SYSTEM POWER switch was inadvertently left in the ON position. Indicator lights on the fueling/defueling panel may be checked by placing the LIGHTS switch in the TEST position. With the switch in the TEST position, a lamp test circuit is completed from the FUELING VALVES circuit breaker to the four DEFUEL VALVE lights and the fueling manifold ISOLATION VALVE light. Other contacts of the test switch complete similar lamp test circuits that check theSET POINT TEST lights and VALVE CLOSED indicator lights.

The fueling/defueling manifold isolation valve must be opened to permit cross-ship filling of tanks in the opposite wing. If pressure fueling adapters on only one side of the aircraft are used. This valve is actuated by placing the ISOLATION VALVE switch on the fueling/defueling panel to the OPEN position. When in the OPEN position, the switch completes a circuit from the refueling bus transfer relay, through the DEFUELING CONTROL PWR circuit breaker to energize the manifold isolation valve relay. 28V dc power
R is applied through the JTSN & DEFUEL 2L & 2R circuit breaker



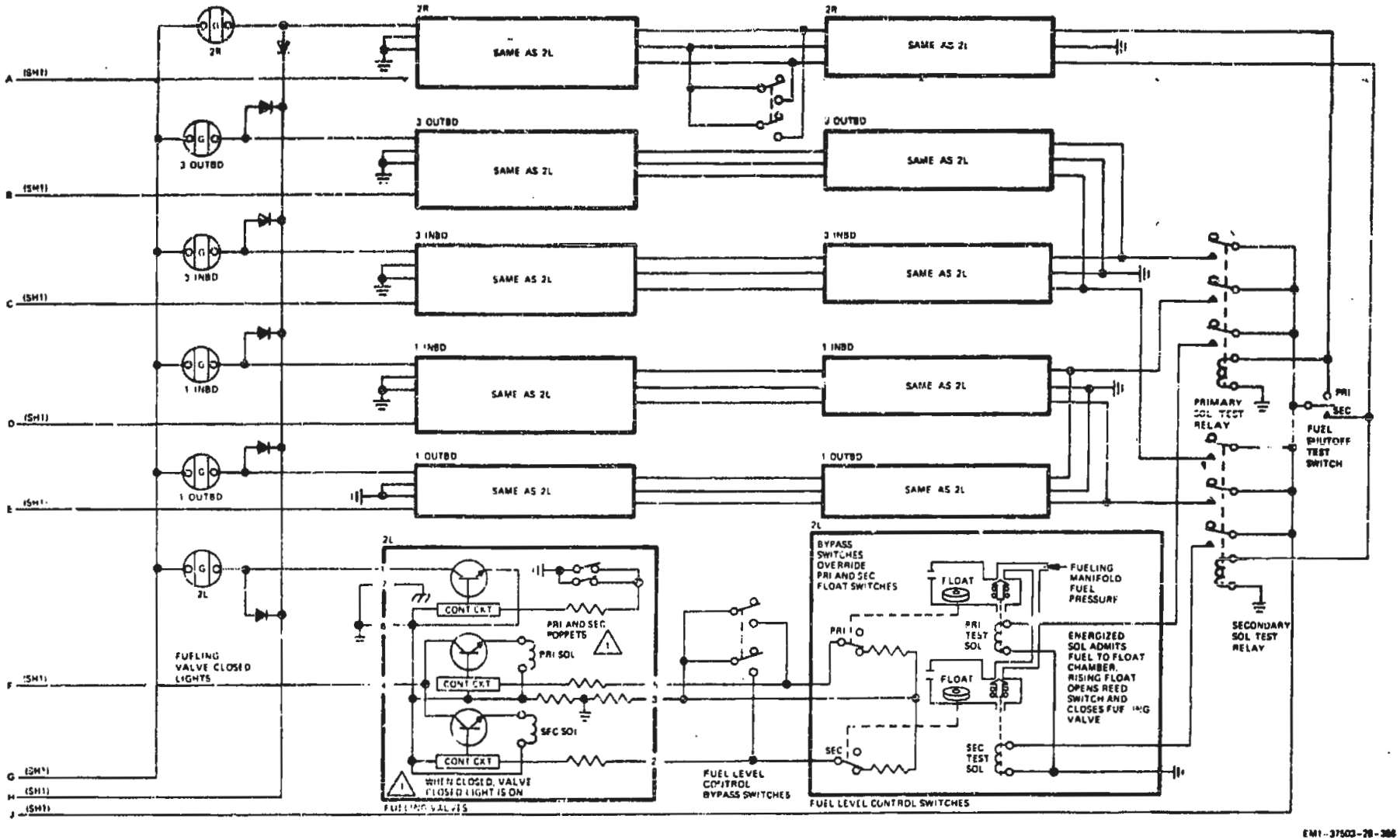
R Pressure Fueling System Simplified Schematic
R Figure 9 (Sheet 1)

EFFECTIVITY: 001-024, 027 WITHOUT SB28-056



R
R Pressure Fueling System Simplified Schematic
Figure 9 (Sheet 1)

EFFECTIVITY: 001-024, 027 WITH SB28-056



Pressure Fueling System Simplified Schematic
Figure 9 (Sheet 2)

R EFFECTIVITY: 001-024, 027
R

to open the fueling/defueling manifold isolation valve. The disagreement light above the switch will come on while the valve is in-transit and then go out to indicate that the switch and valve positions are in agreement.

When the GAUGES TEST switch is actuated to the TEST position, a circuit is completed from the FUEL - SYS GA RPTR IND circuit breaker through the refueling bus transfer relay to the signal conditioner and fuel gages. This test will cause all fuel quantity indicators to drive upscale and verifies operational status of the fuel quantity indicating system (Ref. 28-41-00). The indicator pointers should return to their previous positions when the switch is released.

NOTE: Placing the GAUGES TEST switch to the TEST position applies a simulated full tank input signal to the signal conditioners. The signal conditioners respond by driving the fuel quantity indicators upscale. At the same time the set point test relay in the indicators is energized and the electrical power circuit to the fueling valves is interrupted and the SET POINT lights go out. If done during a fueling operation the fueling valves will close. This will be indicated on the fueling/defueling panel by the respective fueling valve VALVE CLOSED lights coming on.

Applicable FUELING VALVES control switches must be actuated to the OPEN position to allow fuel from the fueling manifold to enter the selected tank. Actuation of a FUELING VALVES switch to the OPEN position completes a circuit from the FUELING VALVES circuit breaker through the fuel quantity indicator set point circuit (Ref. 28-41-00) to the applicable tank fueling valve. When the fuel quantity indicator passes the set point (adjusted by the SET knob and displayed by the index on the indictor dial), a switch will open the circuit. This action deenergizes the solenoids in the fueling valve causing the valve to close. Closing of the valve is indicated when the applicable VALVE CLOSED indicator light comes on.

The FUEL SHUT-OFF TEST switch has three positions: primary (PRI), off, and secondary (SEC). The switch provides the fueling crew with the capability of checking the automatic full tank fuel shutoff functions of the fuel level control switches and valves. Both primary and secondary switch functions are tested. Primary and secondary circuits are redundant, so only the primary circuit will be discussed in detail.

Actuation of the FUEL SHUT-OFF TEST switch to the PRI position completes a circuit from the FUELING VALVE TEST circuit breaker that energizes the primary solenoid test relay. 28V dc power is applied to the primary test solenoids in tank 1, 2L, 2R, and 3 fuel level control switch assemblies. There is no control relay in the test circuit for tank 2R fuel level control switch; power is applied through the FUEL SHUT-OFF TEST switch directly to the fuel level control solenoid.

Switches in the fuel level control act as logic gates for two solid state relays in the fueling valve. Energizing the primary test solenoid opens a poppet which admits fuel from the pressurized fueling/defueling manifold to the fuel level control primary float chamber through a precheck port. The rising float magnetically opens the primary gate switch which, in turn, removes a ground from the solid state relay that controls the primary poppet solenoid in the fueling valve. This deenergizes the solenoid and closes the poppet. Balancing of differential fuel pressures across the spring loaded primary valve diaphragm causes the valve to close. Fueling valve contact surfaces act as logic gates for a solid state relay controlled VALVE CLOSED light circuit. With the primary valve closed, a ground is established for the solid state relay control circuit. The relay closes and the VALVE CLOSED light on the fueling/defueling panel comes on. Since the above test is dependent on the interaction of fuel pressures in the fueling valve, the test must be performed with pressure applied at the fueling adapters.

Returning the FUEL SHUT-OFF TEST switch to the OFF position deenergizes the fuel test solenoid and closes the precheck port. Fuel drains from the float chamber and the falling float closes the gate switch. The solid state relay energizes the primary solenoid. The primary poppet opens and the valve opens. With the gate circuit opened, the VALVE CLOSED light goes out and fuel is again admitted to the tank.

Closing of the fueling valve when the tank is full occurs automatically in the same manner as described above, however, at this time the fuel level control gates are closed by rising fuel entering the float chambers through the drain holes in the chamber wall.

The light in the REFUEL POWER switchlight at the Flight Engineer/Second Officers FUEL SYSTEM control panel, zone 215, will come on whenever the SYSTEM POWER switch on the fueling/defueling panel is on. Momentarily depressing the REFUEL POWER switchlight opens the SYSTEM POWER switch holding circuit and deenergizes the fueling/defueling panel

power control circuits. This action is indicated by the REFUEL POWER switchlight going out.

C. Alternate Power Operation

Placing the SYSTEM POWER switch ON when only BAT BUS power is available completes a circuit through the REFUEL ALTN PWR circuit breaker on the galley right circuit breaker panel to energize the REFUEL ALTN POWER remote control circuit breaker. This action applies 28V DC BAT BUS power through the normally closed contacts of the deenergized refueling bus transfer relay (Ref. Fig. 10) to the FUELING VALVES, FUELING VALVE TEST, and DEFUELING (REFUELING) CONTROL PWR circuit breakers. 28V dc BAT BUS power is simultaneously applied through the REFUEL PWR CONT circuit breaker and REFUEL POWER switchlight to establish the solenoid hold circuit that keeps the SYSTEM POWER switch latched in.

The fueling/defueling manifold isolation valve is dependent on power from DC BUS 1 and is therefore not electrically operable when only battery bus power is used. The valve, however, may be manually opened if required.

The fueling valve control circuitry, using only dc battery bus power, operates as described under Paragraph A.

PRESSURE FUELING SYSTEM - DESCRIPTION AND OPERATION

1. General

A pressure fueling system (Ref. Fig. 1) permits individual or simultaneous fueling of all fuel tanks through one or both dual port fueling hose adapters located in the right and left wing leading edge sections. Pressure fueling (and defueling operations are controlled from a fueling/defueling panel located between the right wing fueling hose adapters (Ref. Fig. 2 and 3). Essentially all fuel distribution piping and manifolding used in pressure fueling the aircraft is also common to the defueling system (Ref. 28-22-00). Common elements are the fueling/defueling panel, a cross-ship fueling/defueling manifold, manifold isolation valve, fuel quantity indicating system (Ref. 28-41-00), fuel level sight gages, fueling/defueling hose nozzle adapters, and electrical power distribution and selection circuits. Components primarily used for pressure fueling operations are listed in Table 1.

Pressure Fueling Components
Table 1

COMPONENT OR CONTROL	NO. UNITS	LOC	FUNCTION	DESCRIPTION
SET POINT TEST Lights	6	Fueling/ defueling panel	Light on indicates fuel quantity in tank is below preset level	Jeweled indicator light (green)
Fuel quantity indicators	4	Fueling/ defueling panel.	Indicates quantity of fuel in tanks	Analog/digital indicator with fuel quantity preset knob.
VALVE CLOSED lights	8	Fueling/ defueling panel	When on, fueling valve is closed	Jeweled indicator light (green)
FUELING VALVES switches	8	Fueling/ defueling panel	Select fueling valve open/close position	DPDT toggle switch

Pressure Fueling Components (Cont)
Table 1

COMPONENT OR CONTROL	NO. UNITS	LOC	FUNCTION	DESCRIPTION
FUEL SHUT-OFF TEST switch	1	Fueling/ defueling panel	PRI position tests primary fuel level control switch circuit SEC position tests secondary fuel level control switch circuit	SPDT momentary contact toggle switch (center off position)
ISOLATION VALVE switch	1	Fueling/ defueling panel	Select manifold isolation valve open/close position.	DPDT toggle switch (solenoid-held in ON position)
ISOLATION VALVE light	1	Fueling/ defueling panel	Light on indicates fueling/ defueling manifold isolation valve is in-transit or in disagreement with selected switch position	Jeweled indicator light (amber)
GAGES TEST switch	1	Fueling/ defueling panel	Tests indicator circuits	SPST toggle switch (OFF - Mom. ON)
LIGHTS TEST switch	1	Fueling/ defueling panel	Tests panel indicator lights	SPST toggle switch (OFF - Mom. ON)
SYSTEM POWER switch	1	Fueling/ defueling panel	ON position supplies power to fueling/ defueling circuits	DPDT toggle switch (solenoid held to ON)

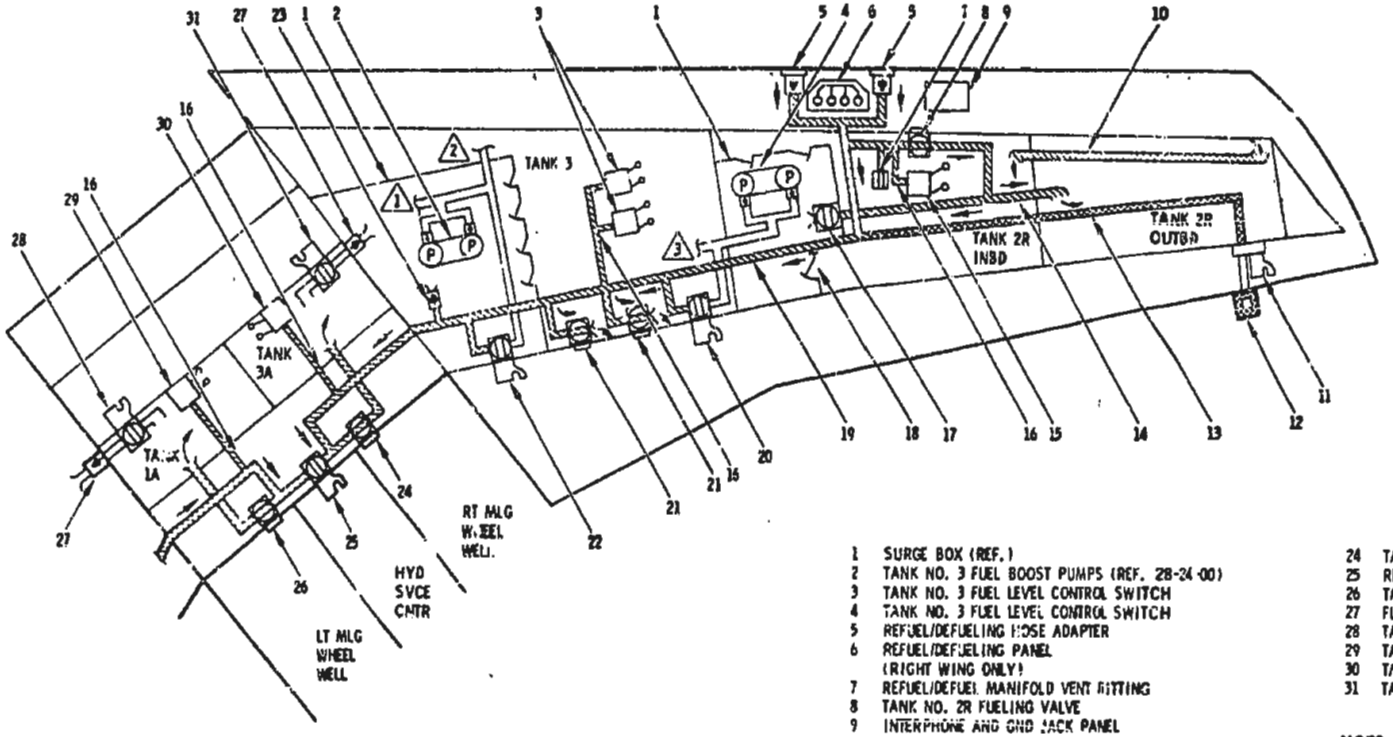
Pressure Fueling Components (Cont)
Table 1

COMPONENT OR CONTROL	NO. UNITS	LOC	FUNCTION	DESCRIPTION
REFUEL POWER switchlight	1	FE/SO FUEL SYSTEM panel	ON light indicates refuel panel SYSTEM POWER switch is ON. Switchlight will release solenoid-held SYSTEM POWER switch	DPDT Mom contact switchlight
REFUEL ALTN POWER RCCB	1	Mid Elec Service Center		
REFUEL BYPASS relay	1	Flight Station Relay Panel	Permits readout of tank 2L/2R INBD and tank 1A/ 3A fuel quantities	
FUELING VALVE BYPASS 2L, 2R, 1A, 3A Switches	4	Left and right wing inter phone Jack panels	Switches override faulty fuel level control switches	DPDT switches
REFUEL POWER relay	1	Mid Elec Service Center	Connects fueling/ defueling circuits to DC SVCE BUS GND EXT	
REFUELING BUS XFER relay	1	Mid Elec Service Center	Controls Switching of normal or alternate power to fueling/ defueling circuits	

Pressure Fueling Components (Cont)
Table 1

	COMPONENT OR CONTROL	NO. UNITS	LOC	FUNCTION	DESCRIPTION
	Fueling valves	8	One in Tank 2L and 2R. Two in Tank 1 and 3. One in Tank 1A and 3A.	Controls fueling flow into tank	
	Fuel level control switch assy	8	One in Tank 2L and 2R. Two in Tank 1 and 3. One in Tank 1A and 3A.	Terminates fueling flow at full tank level	Float actuated switch. Solenoid operated to test
	Fueling/ defueling manifold isolation valve	1	Hyd Service Center	Permits cross-ship fueling and defueling	Motor-operated valve
	PRIMARY SOL TEST relay	1	Mid Elec Service Center	Connects 28V DC test power to fuel level control switch solenoids	
R	SECONDARY SOL TEST relay	1	Mid Elec Service Center	Connects 28V DC test power to fuel level control switch sec. solenoids	

The aircraft is pressure fueled using either, or both, left and right wing fueling hose adapters. Fuel is admitted to tanks 1 and 3 through two electrically controlled, fuel pressure actuated fueling valves in each tank, and automatically terminated when the amount of fuel in the tank reaches the quantity indicated by a SET POINT index on the respective tank fueling/defueling panel fuel quantity gage. Fuel cutoff is



1 SURGE BOX (REF.)
2 TANK NO. 3 FUEL BOOST PUMPS (REF. 28-24-00)
3 TANK NO. 3 FUEL LEVEL CONTROL SWITCH
4 TANK NO. 3 FUEL LEVEL CONTROL SWITCH
5 REFUEL/DEFUELING HOSE ADAPTER
6 REFUEL/DEFUELING PANEL (RIGHT WING ONLY)
7 REFUEL/DEFUEL MANIFOLD VENT FITTING
8 TANK NO. 2R FUELING VALVE
9 INTERPHONE AND GND JACK PANEL (FUEL LEVEL CONTROL BYPASS SWITCHES)
10 HIGH-LEVEL FUEL TRANSFER MANIFOLD
11 FUEL JETTISON VALVE (REF. 28-31-00)
12 FLAME ARRESTOR (REF. 28-31-00)
13 FUEL JETTISON MANIFOLD (REF. 28-31-00)
14 LOW-LEVEL FUEL TRANSFER MANIFOLD
15 TANK NO. 2R FUEL LEVEL CONTROL SWITCH
16 PRECHECK FUEL PRESSURE (TO FUEL LEVEL CONTROL SWITCH ASSY)
17 FUEL TRANSFER VALVE (FLOAT ACTUATED, REF. 28-27-00)
18 FLAPPER CHECK VALVE (TYP) (REF. 28-11-00)
19 REFUEL/DEFUEL MANIFOLD
20 TANK NO. 2R PUMP-DEFUELING VALVE (REF. 28-22-00)
21 TANK NO. 3 FUELING VALVE
22 TANK NO. 3 PUMP-DEFUELING VALVE (REF. 28-22-00)
23 REFUEL/DEFUEL MANIFOLD DRAIN VALVE
24 TANK 3A FUELING VALVE
25 REFUEL/DEFUEL MANIFOLD ISOLATION VALVE
26 TANK 1A FUELING VALVE
27 FLAPPER CHECK VALVE (REF. 28-27-00)
28 TANK 1A GRAVITY TRANSFER VALVE (REF. 28-27-00)
29 TANK 1A FUEL LEVEL CONTROL SWITCH
30 TANK 3A FUEL LEVEL CONTROL SWITCH
31 TANK 3A GRAVITY TRANSFER VALVE (REF. 28-27-00)

NOTE

1. TO CROSS-FEED VALVE
2. TO ENG 3 TANK VALVE (NO. 3 ENG FUEL FEED SYSTEM, REF. 28-24-00)
3. TO FUEL FLOW EQUALIZER (NO. 2 ENG FUEL FEED SYSTEM, REF. 28-24-00)

(4) RIGHT WING SHOWN - LEFT WING IDENTICAL EXCEPT FOR TANK 2R AND 1 COMPONENT NOMENCLATURE

(5) FUELING VALVES ARE SHOWN OPEN

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Pressure Fueling System Diagram
Figure 1

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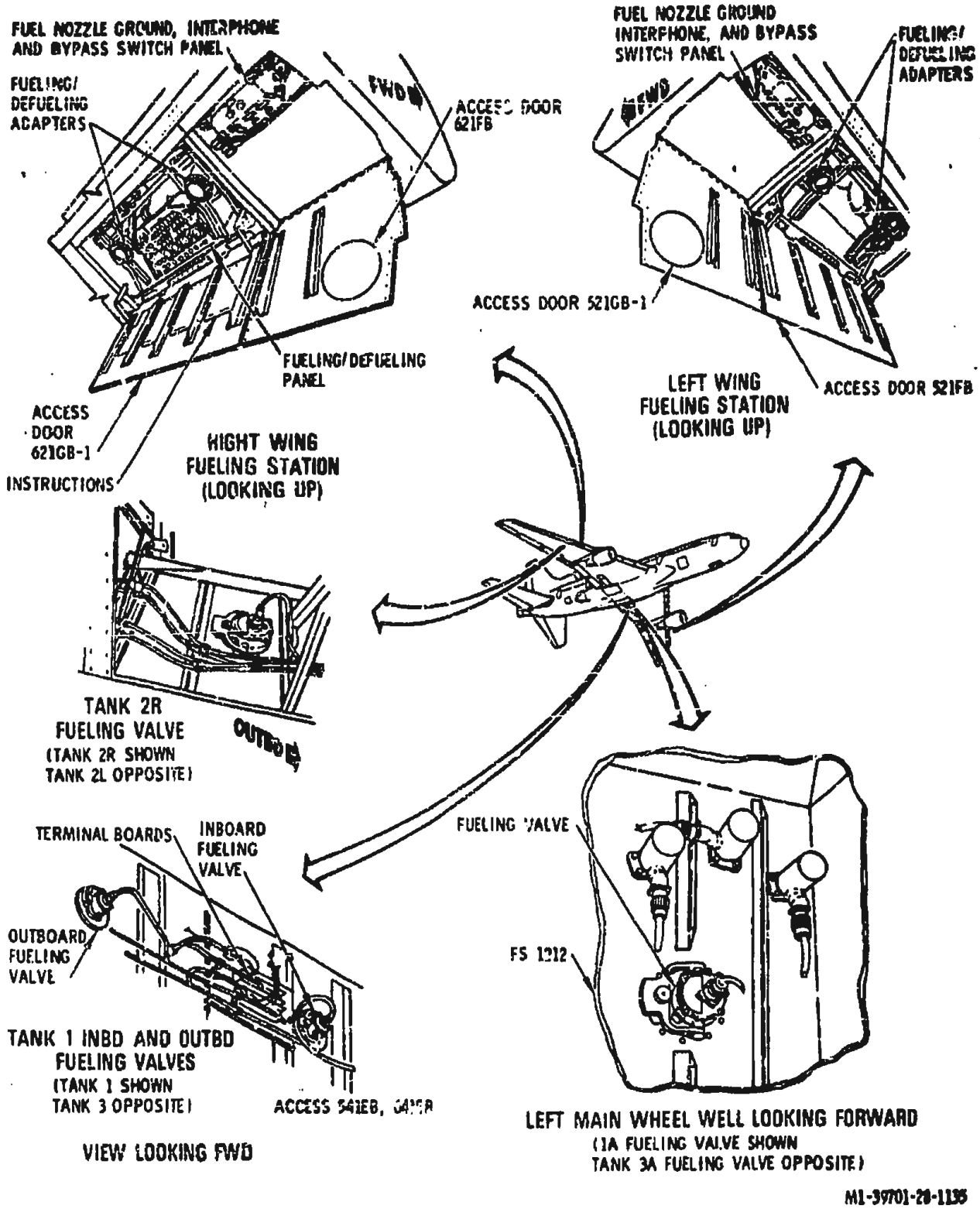
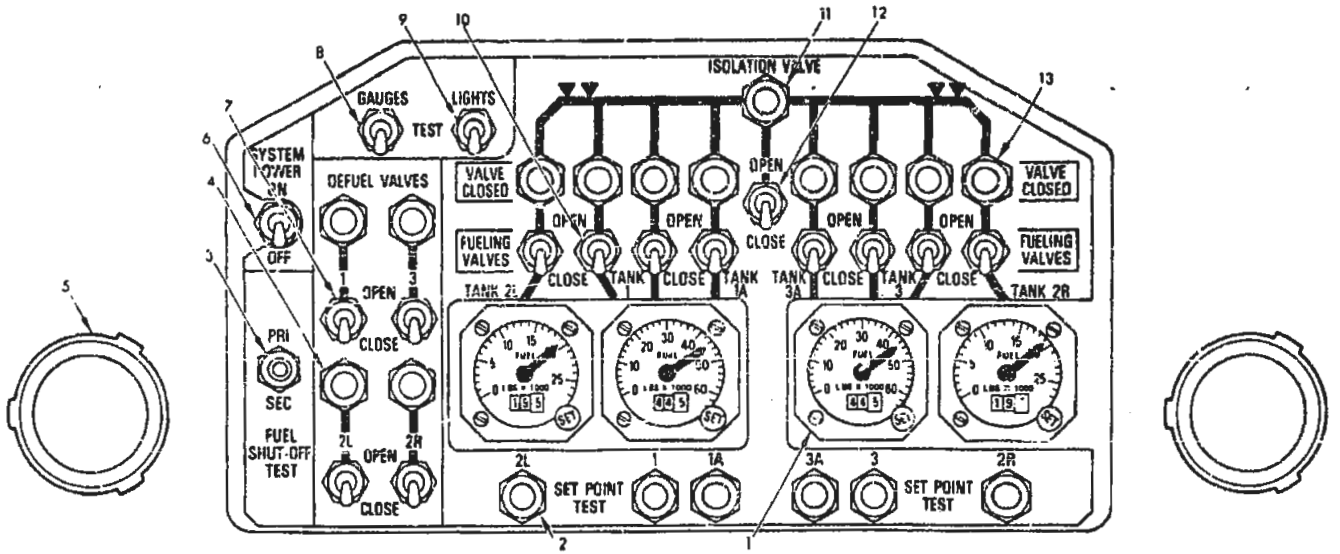


Pressure Fueling System Components
Figure 2

indicated when the corresponding tank fuel quantity gage SET POINT light goes off and fueling valve (VALVE CLOSED) light on the panel comes on. Tanks 2L and 2R are refueled through a single electrically controlled, fuel pressure actuated fueling valve which admits fuel to the outboard section of the tank. The initial amount of fuel pumped into the tank flows into the inboard section surge box through a low-level fuel transfer manifold and float actuated fuel transfer valve. When the surge box fuel level rises high enough to close the float actuated valve, the outboard section will fill. The inboard tank fuel level will remain at this level until the outboard tank level is high enough for fuel to flow once again into the inboard section through a high-level fuel transfer manifold. Refueling flow is terminated when the total amount of fuel in both tank sections reaches the quantity selected on the respective fueling/defueling panel gage. As in tank 1 and 3, fuel cutoff is indicated when the respective tank fuel quantity gage SET POINT light goes off and fueling valve (VALVE CLOSED) light comes on. The maximum amount of fuel admitted to the wing tanks is controlled by high-level fuel control units containing float actuated switches which electrically close the fueling valves.

Center section fuel tanks 1A and 3A are similarly refueled through fueling valves located on the wing center section rear beam in the left and right MLG wheel wells. Tank 1A and 3A fueling valve opening is controlled by the load control (SET POINT) fuel shutoff circuits in the refuel panel tank 1 and 3 fuel gages. With the tank 1 fuel gage SET POINT index set at or below 53,800 lbs. (24,400 Kg), only the fueling valve in tank 1 will be opened and fuel flow into tank 1 will terminate at the quantity indicated by the SET POINT index. When the tank 1 quantity desired and selected by the SET POINT is greater than 53,800 lbs. (24,400 Kg), fuel is simultaneously pumped into both tank 1 and tank 1A. When tank 1A contains an amount of fuel equal to the difference between the amount selected and 53,800 lbs. (24,400 Kg), the tank 1A fueling valve open command is removed. Fuel continues to flow into tank 1 until it is automatically terminated at the full tank level. In the event tank 1 fills before the desired quantity has been loaded, the tank 1 fueling valve open signal is removed and fuel will continue to flow into tank 1A until the desired quantity has been loaded. Overfilling of tank 1A is prevented by a float actuated high level fuel shutoff similar to that in tank 1.

Fuel will not normally be loaded into tank 1A unless the wing tanks are filled to maximum capacity. For ground maintenance purposed, however, it is possible to refuel tank 1A without admitting fuel to the other tanks. This is done by adjusting the tank 1 gage SET POINTS to a quantity greater than 53,800 lbs (24,400 Kg) and opening just the tank 1A fueling valve. With refuel panel power on, and the fueling/defueling manifold pressurized, fuel will enter only tank 1A.



1 FUEL QUANTITY INDICATOR (4 PLACES)

- PROVIDES DIGITAL AND ANALOG INDICATION OF FUEL QUANTITY (REF. 28-41-00).
- INCORPORATES SET POINT INDEX TO PERMIT SELECTION OF DESIRED FUEL QUANTITY. REFUELING IS AUTOMATICALLY TERMINATED WHEN INDICATOR POINTER REACHES INDEX SETTING. TERMINATION OF FUEL FLOW INTO TANK IS INDICATED WHEN CORRESPONDING SET POINT TEST LIGHT GOES OFF AND VALVE CLOSED LIGHT COMES ON (REF. 28-21-00).

2 SET POINT TEST LIGHT (6 PLACES) (REF. 28-21-00)

- PROVIDES INDICATION OF AUTOMATIC SHUTOFF OF FUELING FLOW. LIGHT GOES OFF WHEN INDICATOR POINTER PASSES SET POINT INDEX (REF. 28-21-00)

3 FUEL SHUTOFF TEST SWITCH (REF. 28-21-00)

- SWITCH IS DOUBLE-POLE DOUBLE-THROW MOMENTARY CONTACT TYPE WITH CENTER OFF POSITION
- PRIMARY AND SECONDARY POSITIONS SIMULATE FUEL TANK CONDITION TO TEST AUTOMATIC FUEL SHUTOFF OPERATION. THE TEST VERIFIES OPERATION OF THE PRIMARY AND SECONDARY PILOT VALVES IN THE FUELING VALVES AND PRIMARY AND SECONDARY SWITCHES IN THE CORRESPONDING FUEL LEVEL CONTROL SWITCHES
- PROPER TEST RESULT IS INDICATED BY ALL VALVE CLOSED LIGHTS COMING ON

4 DEFUEL VALVES LIGHT (4 PLACES) (REF. 28-22-00)

- LIGHT NORMALLY BLINKS ON, THEN OFF WHEN VALVE IS IN-TRANSIT TO OPEN OR CLOSED POSITION. IF ON STEADY, VALVE IS NOT IN AGREEMENT WITH SWITCH POSITION

5 FUELING/DEFUELING NOZZLE ADAPTER (2 PLACES) (REF. 28-21-00)

- INCORPORATES PROVISIONS FOR ATTACHING STANDARD FUEL HOSE NOZZLES
- NOZZLE ATTACHMENT FLANGE IS DESIGNED TO BREAKAWAY IF PRE-DETERMINED CRITICAL FORCE IS APPLIED TO ADAPTERS THROUGH FUELING HOSES
- BROKEN NOZZLE ATTACHMENT FLANGES CAN BE REPLACED WITHOUT DISASSEMBLY. INTERNAL SPRING LOADED POPPET CLOSES ADAPTER PORT
- TWO FUELING/DEFUELING NOZZLE ADAPTERS ARE ALSO LOCATED IN LEFT WING LEADING EDGE, ZONE 521 FB

6 SYSTEM POWER SWITCH (REF. 28-21-00)

- CONTROLS APPLICATION OF ELECTRICAL POWER TO FUELING/DEFUELING SYSTEM
- WHEN THE SWITCH IS ELECTRICALLY LATCHED IN ON POSITION, SERVICE PANEL LIGHTS COME ON, FUEL QUANTITY INDICATORS ARE POWERED, FUEL SHUTOFF TEST CIRCUIT IS ARMED, VALVE CLOSED INDICATOR LIGHTS COME ON, AND REFUEL POWER SWITCHLIGHT ON FLIGHT ENGINEER SECOND OFFICERS FUEL SYSTEM PANEL COMES ON
- IF INADVERTENTLY LEFT ON, SYSTEM POWER SWITCH CAN BE UNLATCHED TO OFF POSITION BY DEPRESSING REFUEL POWER SWITCHLIGHT

7 DEFUEL VALVES SWITCH (4 PLACES) (REF. 28-22-00)

- OPENS OR CLOSES DEFUELING VALVES

8 GAUGES TEST SWITCH (REF. 28-41-00)

- WHEN HELD IN POSITION, SWITCH CHECKS OPERATION OF FUEL QUANTITY INDICATORS
- ALL FUEL QUANTITY INDICATORS DRIVE FULL UPSCALE
- CORRESPONDING SET POINT LIGHTS GO OUT
- ANY FUELING VALVE THAT IS OPEN WILL CLOSE
- SWITCH OPERATES IN PARALLEL WITH QUANTITY TEST SWITCH ON FLIGHT ENGINEER/SECOND OFFICERS FUEL SYSTEM PANEL

9 INDICATOR LIGHTS TEST SWITCH (REF. 28-21-00)

- TESTS PANEL INDICATOR LIGHTS. ANY LIGHT NOT ALREADY ON WILL COME ON WHEN SWITCH IS HELD IN TEST POSITION

10 FUELING VALVE CONTROL SWITCH (8 PLACES) (REF. 28-21-00)

- ARMS FUELING VALVE CIRCUIT FOR OPEN OPERATION
- FUEL PRESSURE IS REQUIRED TO OPEN FUELING VALVE

11 ISOLATION VALVE LIGHT (REF. 28-21-00)

- LIGHT NORMALLY BLINKS ON, THEN OFF, WHEN VALVE IS IN-TRANSIT TO OPEN OR CLOSED POSITION. IF ON STEADY, VALVE IS NOT IN AGREEMENT WITH SWITCH POSITION

12 ISOLATION VALVE SWITCH (REF. 28-21-00)

- OPENS FUELING/DEFUELING MANIFOLD ISOLATION VALVE TO PERMIT FUELING/DEFUELING OF ALL TANKS THROUGH ADAPTERS IN ONE WING ONLY
- PERMITS CROSS-SHIP TRANSFER OF FUEL BY MAINTENANCE PERSONNEL

13 FUELING VALVE POSITION LIGHT (8 PLACES) (REF. 28-21-00)

- LIGHT IS ON WHEN CORRESPONDING FUELING VALVE IS CLOSED

M1-25001-28-1036

Fueling/Defueling Panel
Figure 3

R EFFECTIVITY: 025-026, 028-999
R

Refueling of tank 3 and 3A is accomplished in the same manner as described above for tank 1 and 1A.

On aircraft 025-026, 028-031,
an interphone and fuel nozzle ground jack panel containing tank 2R and 3A fuel level control bypass switches is located just outboard of the fueling/defueling panel in the right wing. Similar bypass switches for tank 2L and 1A fuel level control switch units are located on an interphone and fuel nozzle ground jack panel next to the fueling hose adapters in the left wing.

On aircraft 032-999,
an interphone and fuel nozzle ground jack panel containing tank 2R, 3, and 3A fuel level control bypass switches is located just outboard of the fuel/defueling panel in the right wing leading edge section.

Similar bypass switches for tank 2L, 1 and 1A fuel level control switch units are located on an interphone and fuel nozzle ground jack panel next to the fueling hose adapters in the left wing.

2. Fueling/Defueling Panel

A. Description and Operation

The fueling/defueling panel (Ref. Fig. 3) contains control switches, indicating lights, and fuel quantity indicators necessary for fueling the aircraft. Individual control switches and valve position indicating lights are provided for each fueling valve. A control switch is also provided for opening the cross-ship fueling/defueling manifold isolation valve when a tank is fueled using only the fueling hose adapters in the opposite wing. Provisions are incorporated for presetting the amount of fuel desired in each tank. The amount of fuel desired is selected by adjusting an index (bug) on the respective tank fuel quantity indicator dial to the required fuel reading. The tank fueling valve is automatically closed and fuel flow terminated when the indicator pointer has rotated upscale to the indexed reading. The exact point of fuel cutoff is indicated when the SET POINT TEST light next to the indicator on the fueling/defueling panel goes out. The system also automatically terminates fueling at the full tank level. This function is checked during the fueling operation by fuel shutoff test provisions built into the fuel level control switch assemblies and fueling valves, and controlled by a FUEL SHUT-OFF TEST switch on the panel.

3. Fueling/Defueling Hose Adapter

A. Description and Operation

Two fueling/defueling hose adapters (Ref. Fig. 4) are located in each wing leading edge section at the fueling/defueling stations. Each adapter assembly consists of an elbow-shaped housing, a spring-loaded poppet check valve, a protective cap, and a bayonet flange which will accept and retain a standard fueling/defueling hose nozzle. The bayonet flange is designed to break away in order to prevent damaging the adapter assembly if a force exceeding a predetermined level is inadvertently applied to the fueling/defueling hose. The bayonet flange is easily replaced without disassembly of the adapter; the spring-loaded poppet check valve prevents loss of fuel from the fueling/defueling manifold. A spring-loaded seal in the cap prevents passage of fuel into the wing leading edge if seepage occurs past the poppet check valve.

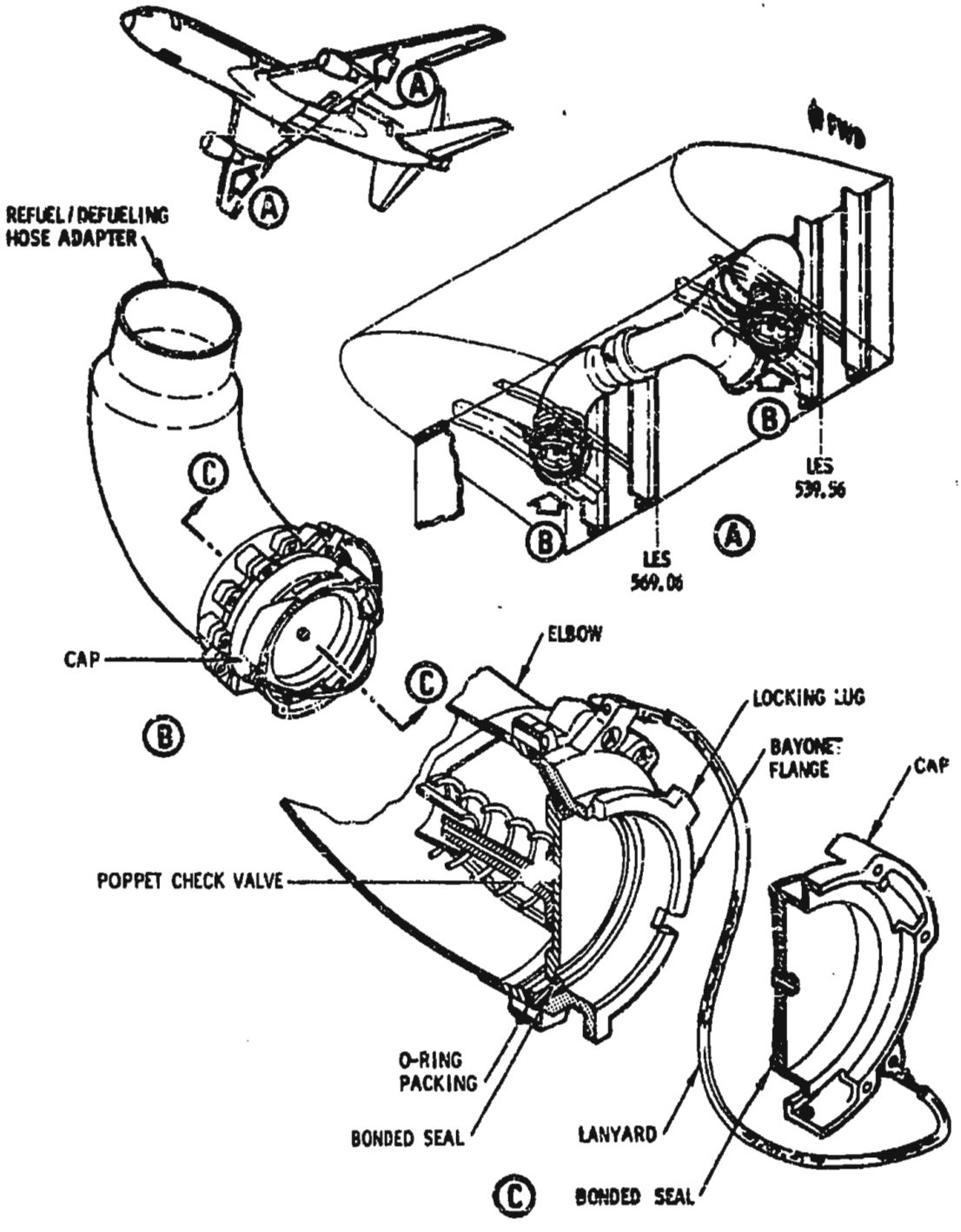
4. Fuel Level Control Switches

A. Description and Operation

Identical fuel level control switch assemblies, (Ref. Fig. 5, 6, and 7), operate in conjunction with the fueling valves (Ref. Fig. 8) to automatically terminate fueling at full tank levels. Basic components in the assemblies are two float chambers, two float operated primary and secondary magnetically actuated switches, primary and secondary test solenoids and precheck poppets, and the switch body. Provisions are incorporated in the body for the attachment of an electrical wiring conduit and a fuel pressure sensing line. Wiring in the unit is isolated from fuel by potting compound and routed to the two switches and solenoids through internal passages in the switch assembly body. Both switches and solenoids are encapsulated. The switches are vertically mounted in the float chambers and surrounded by the floats. They are normally closed. In operation, fuel entering the float chambers causes the floats to rise and magnetically open the switches.

A lock-wired and lead-sealed fitting in the precheck fuel inlet port houses a mesh screen. The screen is normally removed for inspection in the overhaul shop.

During fueling, the primary and secondary float switches in all fueling valves may be individually tested by placing the FUEL SHUT-OFF TEST switch, on the fueling/defueling control panel, to primary and secondary positions. Placing the test switch to the PRI position energizes the primary solenoids.



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Fueling/Defueling Hose Adapter
Figure 4

This opens a poppet and admits fuel from the fueling/defueling manifold to the primary float switch chamber through a precheck port. The float rises and opens the switch. Opening of the switch closes the fueling valves and is indicated by the panel VALVE CLOSED lights coming on. Placing the test switch to the OFF position deenergizes the solenoid and closes the poppet. Fuel drains from the float chamber and the falling float permits the switch to close and the fueling valve to reopen. The secondary float switch in each unit is tested in the same manner by placing the test switch to the SEC position.

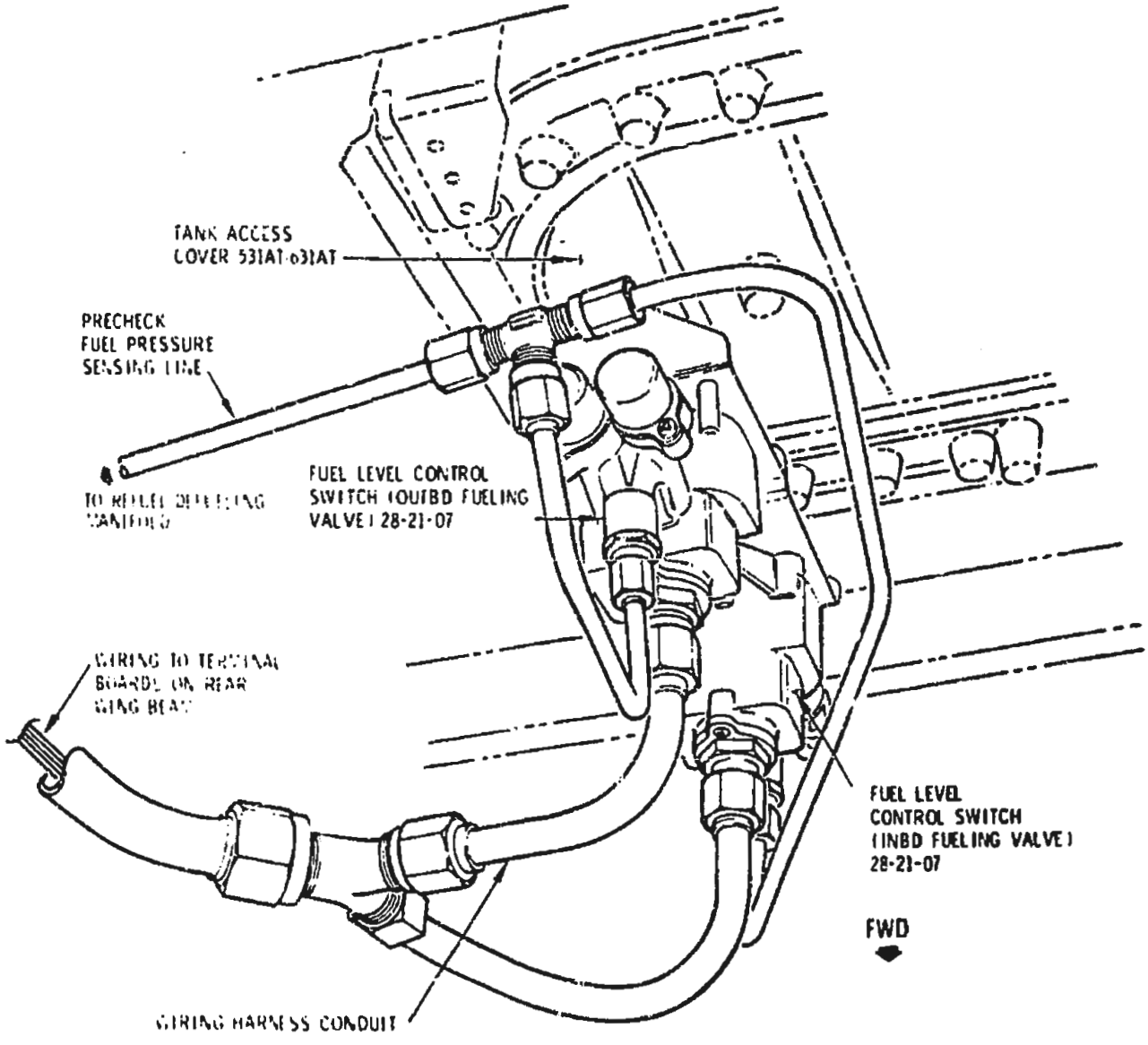
5. Fueling Valves

A. Description and Operation

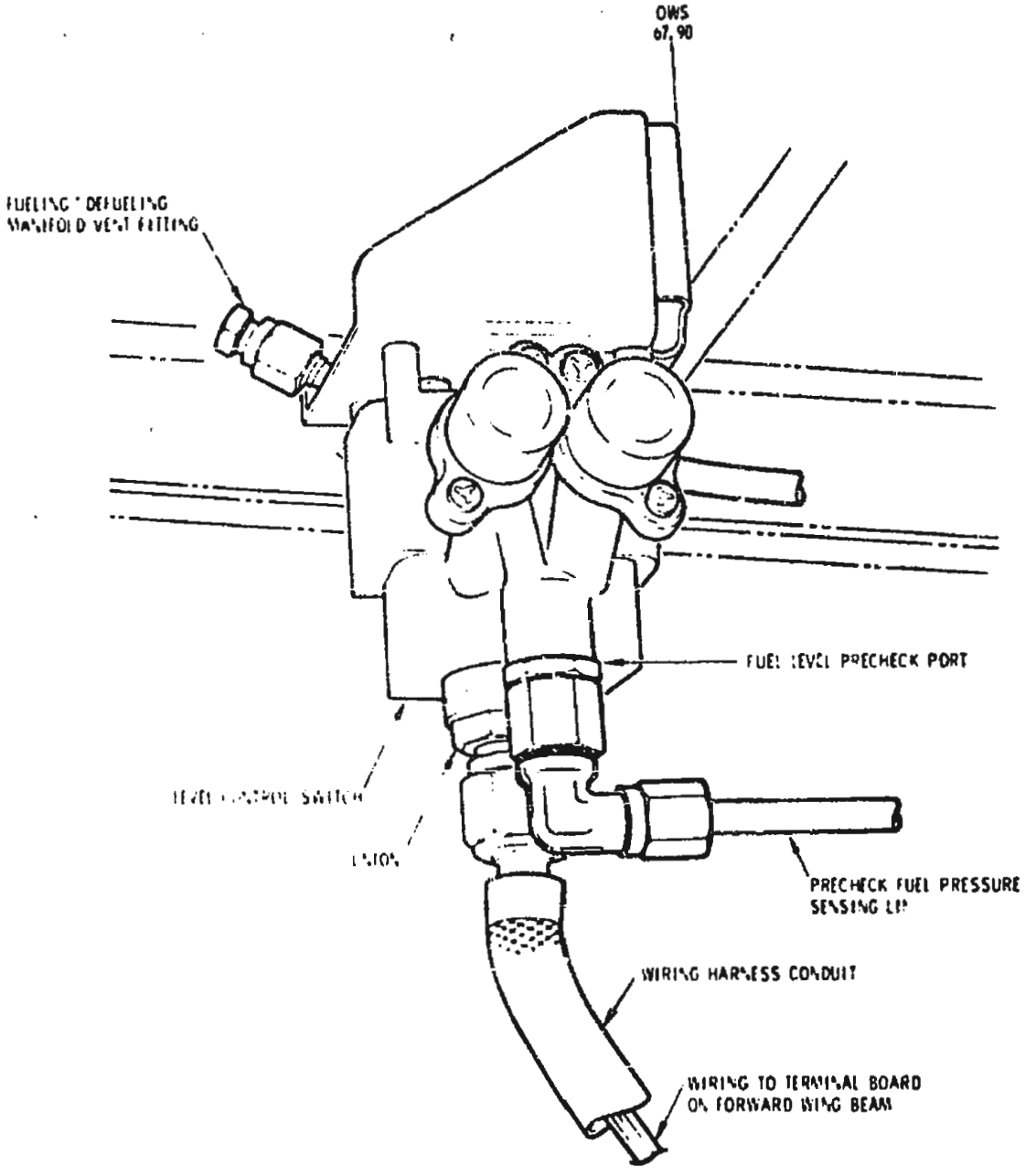
Electrically controlled, fuel pressure actuated fueling valves (Ref. Fig. 8) control the flow of fuel into each tank from the fueling/defueling tank interconnect manifold. One fueling valve for tank 2L and one for tank 2R is mounted on the wing forward spar at outer wing station 67.90. Two tank 1 and two tank 3 fueling valves are mounted on the wing rear spars at inner wing stations 387.17 and 406.00. Tank 1A and 3A fueling valves are mounted on the wing center section
R rear beams in the main wheel wells.

Primary valve components are a valve housing and a line replaceable plug-in module. Valve housings are mounted on the wing spars inside the tank with fuel inlet and outlet ports connected to the refuel/defueling manifold by WIG-O-FLEX couplings. Plug-in modules are interchangeable line-replaceable units. When the plug-in module is removed, a circular sleeve within the housing is rotated to shut off the housing fuel inlet and outlet ports. Module replacement is thus accomplished without defueling or entering the tank.

Other than the housing sleeve, all operating parts of the valve assembly are contained in the plug-in module. These parts include primary and secondary poppets and solenoids, primary and secondary diaphragm valves, valve body, primary and secondary metering pins, thermal relief valves, a reverse pressure check valve, and a capsule containing three solid state relays. The valve operates in conjunction with its corresponding fuel level control switch assembly. The primary and secondary float actuated switches in the fuel control switch assembly act as logic on/off gates for the solid state relays in the valve. When closed, the gates provide a ground for the solid state relay control circuits. Application of 28V dc power when the FUELING VALVES switch on the fueling/defueling panel is placed in the OPEN position, electronically closes the relay and energizes the



Fuel Level Control Switch, Tank 1 and 3
Figure 5



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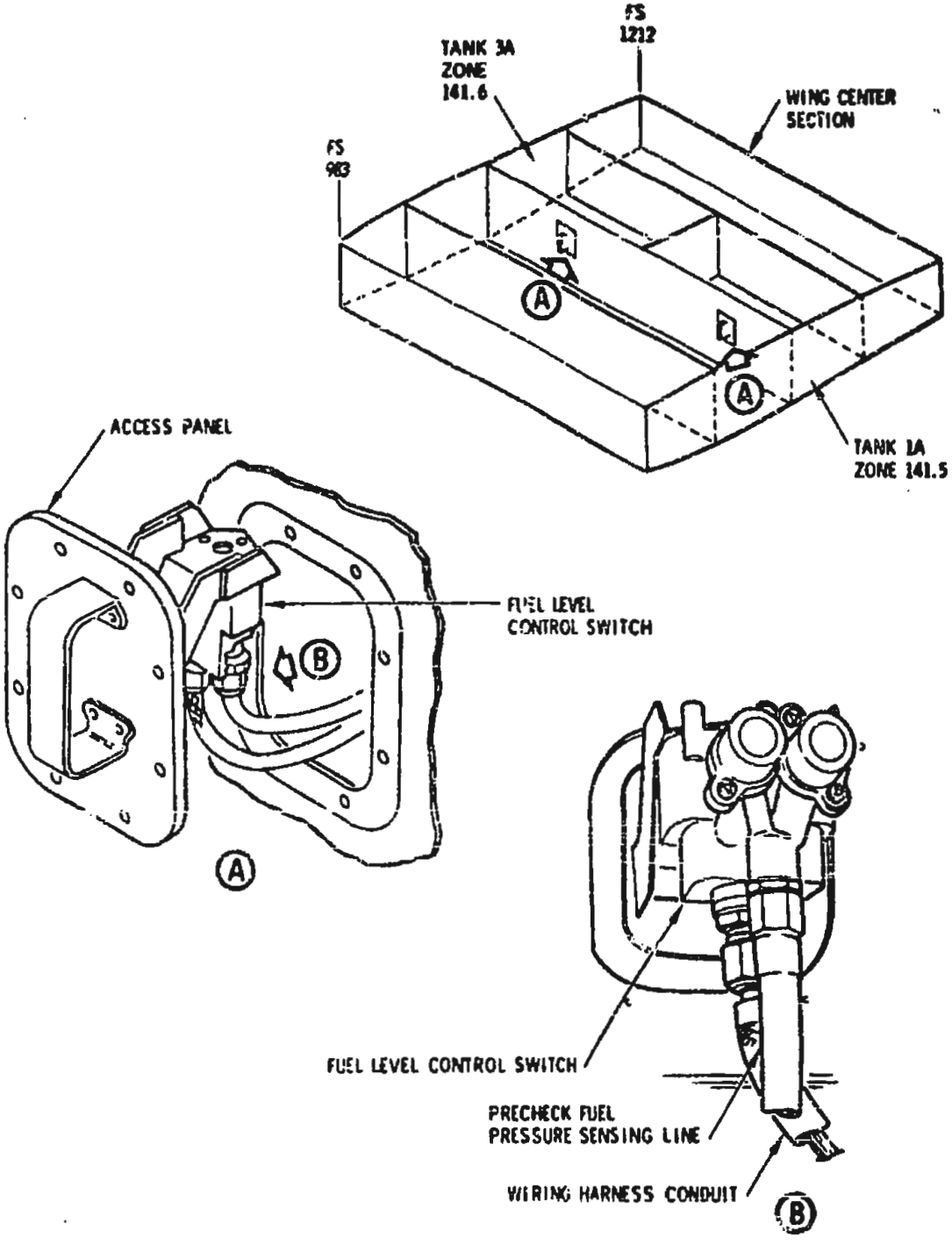
Fuel Level Control Switch, Tank 2L and 2R
Figure 6



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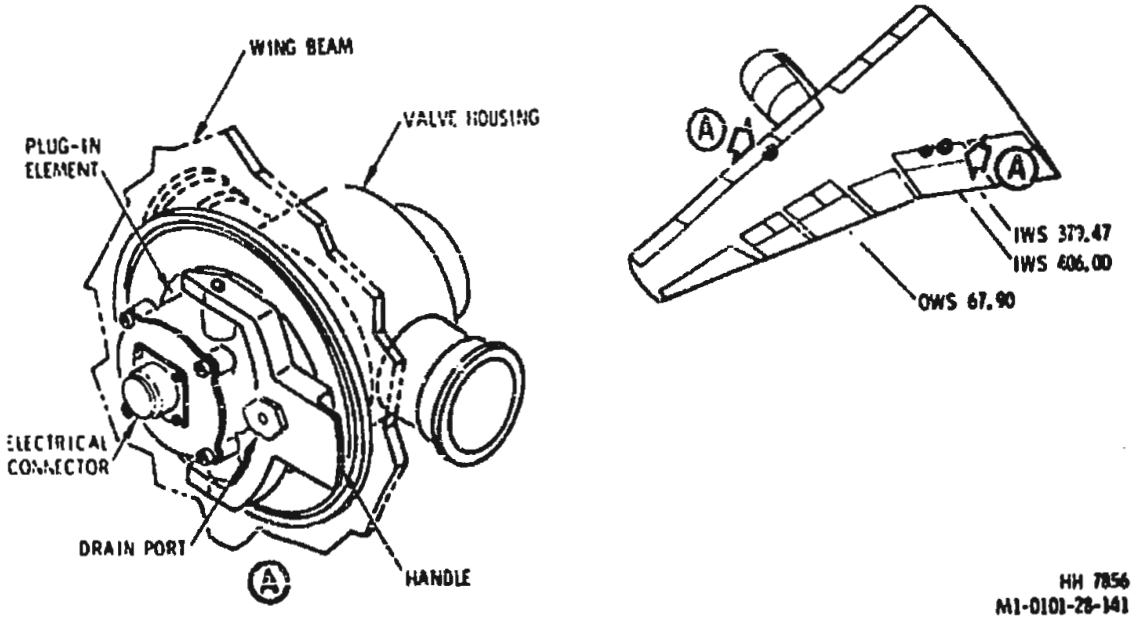
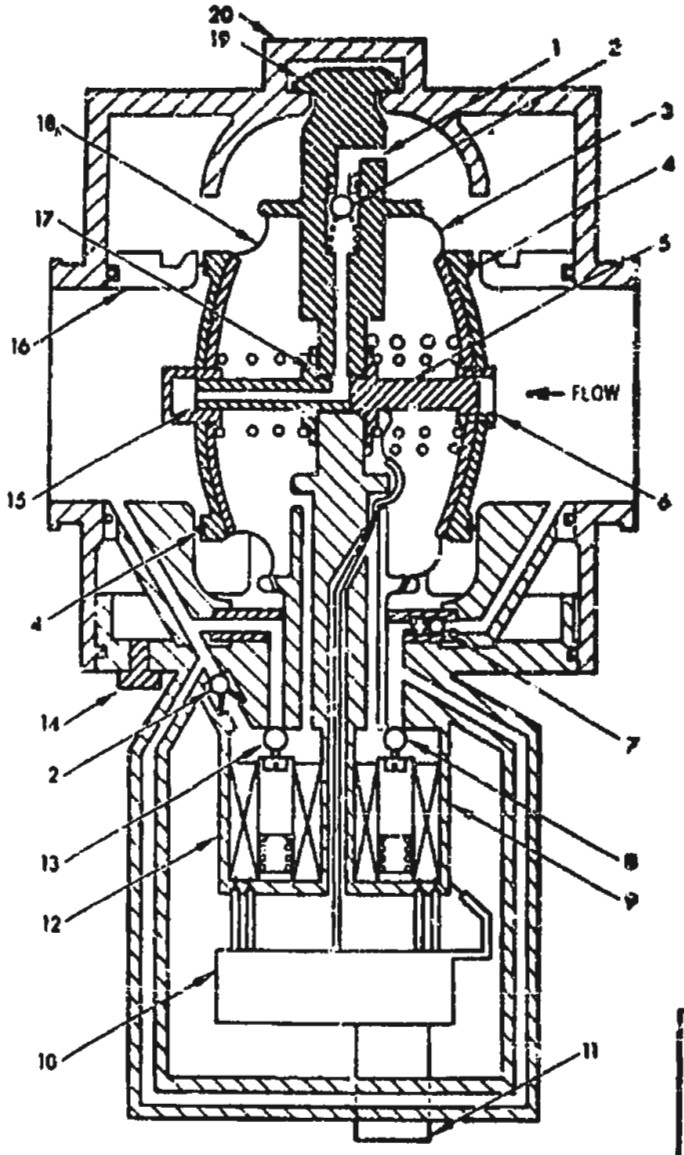
Fuel Level Control Switch, Tank 1A and 3A
Figure 7

ball valve poppet solenoids. This unseats the poppets and allows fuel to bleed off from the back side of the primary and secondary valve diaphragm. Inlet fuel pressure acting against the front side of the diaphragms opens the valves and fuel flows through the valve into the tank. The VALVE CLOSED light on the fueling/defueling panel goes out as described under FUEL LEVEL CONTROL SWITCHES.

At the full tank level, fuel enters the fuel level control switch assembly. The rising floats magnetically open the fuel control gates which removes the ground from the solid state relay control circuits. The relays electronically open and the poppet control solenoids deenergize. The spring loaded poppets close. Inlet fuel pressure admitted to the back side of the primary diaphragm through the primary pickup orifice, and to the back side of the secondary diaphragm through the reverse pressure check valve, builds up until fluid pressure across the diaphragm is equalized. The differential pressure created by the springs on the diaphragms closes the valves, and the fuel flow is shut off. The VALVE CLOSED light on the fueling/defueling panel comes on as described under FUEL LEVEL CONTROL SWITCHES.



Fueling Valve
Figure 8 (Sheet 1)



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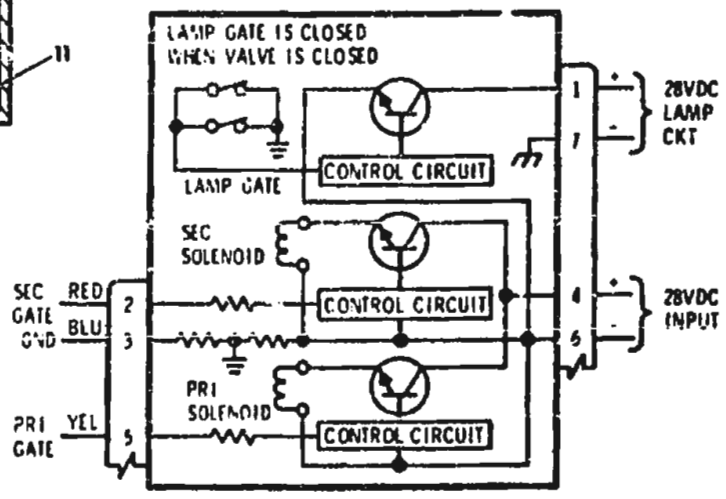
1 SECONDARY PICKUP ORIFICE
2 REVERSE PRESSURE CHECK VALVE
3 PRIMARY DIAPHGRAM
4 POPPET GATE (LAMP ELEC CIRCUIT)
5 PRIMARY METERING PIN
6 PRIMARY PICKUP ORIFICE
7 THERMAL RELIEF VALVE
8 PRIMARY POPPET
9 PRIMARY SOLENOID
10 SOLID STATE RELAY CAPSULE
11 ELECTRICAL CONNECTOR
12 SECONDARY SOLENOID
13 SECONDARY POPPET
14 DRAIN PLUG
15 SECONDARY METERING PIN
16 HOUSING PORT SLEEVE
17 INSULATOR
18 SECONDARY DIAPHRAGM
19 RETAINING BAYONET
20 HOUSING



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Fueling Valve
Figure 8 (Sheet 2)

6. Manifold Vent Fitting

A. Description and Operation

In tank No. 2L and 2R, a line is routed from the fueling/defueling manifold to the vented airspace next to the fuel level control switches. The line is terminated in a vent fitting (Ref. Fig. 6) comprised of a standard MS type plug having a 0.040-inch diameter orifice. The fitting provides sufficient venting of the manifold (when unpressurized) to permit fuel to drain into tanks 1 or 3 through the manifold drain valves (Ref. 28-23-00).

7. Manifold Isolation Valve

The manifold isolation valve is an actuator-driven butterfly valve. It is located in the fueling/defueling manifold in the wing center section box (Ref. Fig. 9).

The valve actuator is accessible from the hydraulic service center, zone 147. When opened, the valve permits cross-ship refueling and transfer of fuel to tanks in the opposite wing. The valve is also opened during fuel jettison (Ref. 28-31-00).

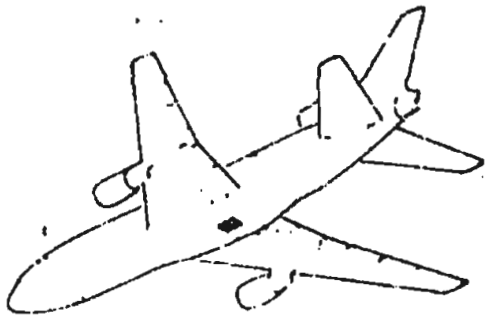
The actuator contains a 28V dc reversible motor and gear train. Limit switches restrict motor operation to the valve open and closed positions. An external disagreement light is turned on whenever the actuator position does not agree with the command switch position. A relay is also included to prevent motor operation when power is applied to both the open and close coils at the same time.

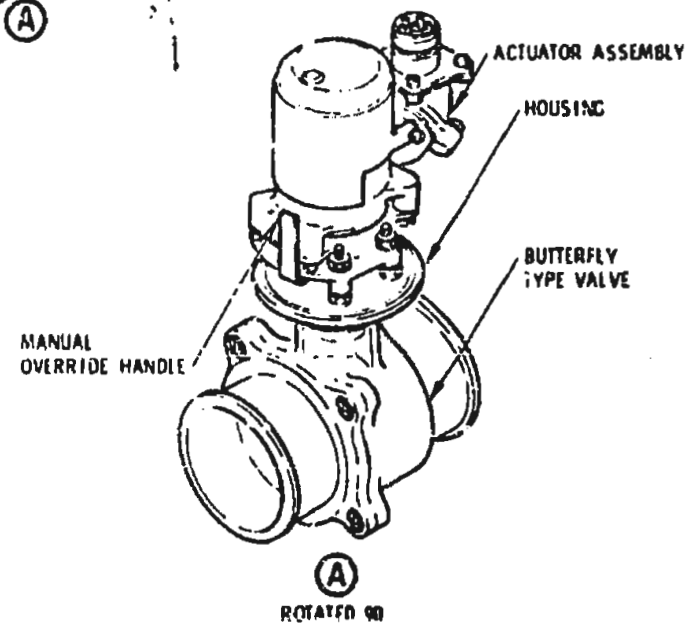
8. System Operation

A. Fueling Power

Two sources of 28V dc power available for operation of the pressure fueling system are automatically selected by a power transfer relay when the solenoid-held SYSTEM POWER switch on the fueling/defueling panel is actuated (Ref. Fig. 3 and 10). Normal 28V dc power is acquired from the DC GND SVCE BUS EXT bus. Alternate 28V dc power is obtained from the BATTERY BUS and is automatically applied when there is no power at the DC GND SVCE BUS EXT bus.

If power is available at the DC GND SVCE BUS EXT bus when the SYSTEM POWER switch is placed in the ON position, the refueling bus transfer relay will be energized and normal dc power will be applied to the system. If normal power is not available, the refueling bus transfer relay will remain





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Manifold Isolation Valve
Figure 9

deenergized and alternate power will be applied to the system through the normally closed contacts of the relay.

Fueling/defueling panel gages acquire 115V ac power from PASS SVCE BUS 1R bus through energized contacts of FUELING BUS XFER relay (2821-K1) when the panel SYSTEM POWER switch is latched on.

R On aircraft 025-026, 028-031 with SB28-056 and 032-999, 115V ac power to the fueling/defueling panel gages is not dependent on an energized 2821-K1 relay and the gages will have operating power applied at all times the PASS SVCE BUS is energized.

If ac power is not available, the fuel quantity indicating system gages, and automatic full tank fuel shutoff circuitry, will be inoperative. Under these conditions, the aircraft may still be pressure fueled using BAT BUS power and the alternate power circuitry. The amount of fuel pumped into the aircraft tanks must be closely monitored using the fuel tank sight gage sticks and refueling source fuel flow gages.

Operation of the pressure fueling system is normally preceded by external grounding of the aircraft and fueling equipment, connection of hoses from the fuel supply facility or truck(s) to the fueling hose adapters, adjustment of the fueling/defueling panel fuel quantity indicator set point indexes, and verification that the following circuit breakers are closed:

Galley Left Circuit Breaker Panel

DC BUS - PWR REFUELING

Galley Right Circuit Breaker Panel

FUEL - SYS GA RPTR IND

REFUEL - ALTN POWER

DEFUELING CONTROL PWR

FUELING - VALVE TEST

FUELING - VALVES

REFUEL - PWR CONT

Flight Engineer/Second Officers aft circuit breaker panel CB3

B. Normal Power Operation

Fueling and defueling systems do not have electrical power until the SYSTEM POWER switch on the fueling/defueling panel is placed in the ON position (Ref. Fig. 10). Placing the SYSTEM POWER switch ON energizes the REFUEL POWER relay and applies 28V dc power from the DC GND SVCE BUS EXT through the REFUEL PWR CONT circuit breaker to electrically latch the solenoid-held SYSTEM POWER switch in the ON position. At the same time the refueling bus xfer relay is energized making dc power available at the defuel valve, fueling valve, and fueling valve test circuit breakers. Routing of the SYSTEM POWER switch solenoid-hold circuit through the REFUEL POWER switchlight allows the Flight Engineer/Second Officer to override the SYSTEM POWER switch hold circuit and remove power from the fueling/defueling panel.

Indicator lights on the fueling/defueling panel may be checked by placing the LIGHTS switch in the TEST position. With the switch in the TEST position, a lamp test circuit is completed from the FUELING VALVES circuit breaker to the DEFUEL VALVE and SET POINT TEST lights and the fueling manifold ISOLATION VALVE light. Other contacts of the test switch complete similar lamp test circuits that check the six fueling valve VALVE CLOSED indicator lights.

The fueling/defueling manifold isolation valve must be opened to permit cross-ship filling of tanks in the opposite wing if pressure fueling adapters on only one side of the aircraft are used. This valve is actuated by placing the solenoid-held ISOLATION VALVE switch on the fueling/defueling panel to the OPEN position. When in the OPEN position, the switch energizes the MANIFOLD ISLN VALVE relay which applies 28V dc power from the DEFUEL 2L & 2R circuit breaker to open the fueling manifold isolation valve. The disagreement light above the switch will come on while the valve is in-transit and then go out to indicate that the switch and valve positions are in agreement.

When the GAUGES TEST switch is actuated to the TEST position, a circuit is completed from the FUEL - SYS GA RPTR IND circuit breaker through the refueling bus transfer relay to the signal conditioner and fuel gages. This test will cause all fuel quantity indicators to drive upscale and verifies operational status of the fuel quantity indicating system (Ref. 28-41-00). The indicator pointers should return to their previous positions when the switch is released.

NOTE: Placing the GAUGES TEST switch to the TEST position applies a simulated full tank input signal to the signal conditioners. The signal conditioners respond by driving the fuel quantity indicators upscale. At the same time the set point relays in the indicators are energized and the electrical power circuit to the fueling valves is interrupted and the set point lights go out. If done during a fueling operation, the fueling valves will close. This will be indicated on fueling/defueling panel by the respective fueling valve VALVE CLOSED lights coming on.

Applicable FUELING VALVES control switches must be actuated to the OPEN position to allow fuel from the fueling manifold to enter the selected tank. Actuation of a FUELING VALVES switch to the OPEN position completes a circuit from the FUELING VALVES circuit breaker through the fuel quantity indicator set point switch to the applicable tank fueling valve. When the fuel quantity indicator passes the set point switch actuating point (adjusted by the SET knob and displayed by the index on the indicator dial), the switch will open the circuit. This action deenergizes the solenoids in the fueling valve causing the valve to close. Closing of the valve is indicated when the applicable VALVE CLOSED indicator light comes on.

The FUEL SHUT-OFF TEST switch has three positions: primary (PRI), off, and secondary (SEC). The switch provides the fueling crew with the capability of checking the automatic full tank fuel shutoff functions of the fuel level control switches and valves. Both primary and secondary switch functions are tested. Primary and secondary circuits are redundant, so only the primary circuit will be discussed in detail.

Actuation of the FUEL SHUT-OFF TEST switch to the PRI position completes a circuit from the FUELING VALVE TEST circuit breaker that energizes the primary solenoid test relay. 28V dc power is applied to the primary test solenoids in tank 1, 1A, 2L, 3 and 3A fuel level control switch assemblies. The test circuit for Tank 2R is not wired through the solenoid test relay; power is applied through the FUEL SHUT-OFF TEST switch directly to the fuel level control solenoid.

Switches in the fuel level control act as logic gates for two solid state relays in the fueling valve. Energizing the primary test solenoid opens a poppet which admits fuel from the pressurized fueling/defueling manifold to the fuel level control primary float chamber through a precheck port. The rising float magnetically opens the primary gate switch

which, in turn, removes a ground from the solid state relay that controls the primary poppet solenoid in the fueling valve. This deenergizes the solenoid and closes the poppet. Balancing of differential fuel pressures across the spring loaded primary valve diaphragm causes the valve to close. Fueling valve contact surfaces act as logic gates for a solid state relay controlled VALVE CLOSED light circuit. With the primary valve closed, a ground is established for the solid state relay control circuit. The relay closes and the VALVE CLOSED light on the fueling/defueling panel comes on. Since the above test is dependent on the interaction of fuel pressures in the fueling valve, the test must be performed with pressure applied at the fueling manifold adapters.

Returning the FUEL SHUT-OFF TEST switch to the OFF position deenergizes the fuel test solenoid and closes the precheck port. Fuel drains from the float chamber and the falling float closes the gate switch. The solid state relay energizes the primary solenoid. The primary poppet opens and the valve opens. With the gate circuit opened, the VALVE CLOSED light goes out and fuel is again admitted to the tank.

Closing of the fueling valve when the tank is full occurs automatically in the same manner as described above, however, at this time the fuel level control gates are closed by rising fuel entering the float chambers through the drain holes in the chamber wall.

R Fuel level control switch bypass switches are installed on the interphone and ground jack panels next to the fueling hose adaptors in each wing. They are wired in parallel with the wing and center section tank float actuated fuel level control switches and are primarily maintenance aids used to bypass or override the fuel level control switches if a malfunctioning switch prevents opening of the fueling valve.

The light in the REFUEL POWER switchlight at the Flight Engineer/Second Officers FUEL SYSTEM control panel, zone 215, will come on whenever the fueling SYSTEM POWER switch on the fueling/defueling panel is on. Momentarily depressing the REFUEL POWER switchlight opens the SYSTEM POWER switch holding circuit and deenergizes the fueling/defueling panel power circuits. This action is indicated by the REFUEL POWER switchlight ON light going out.

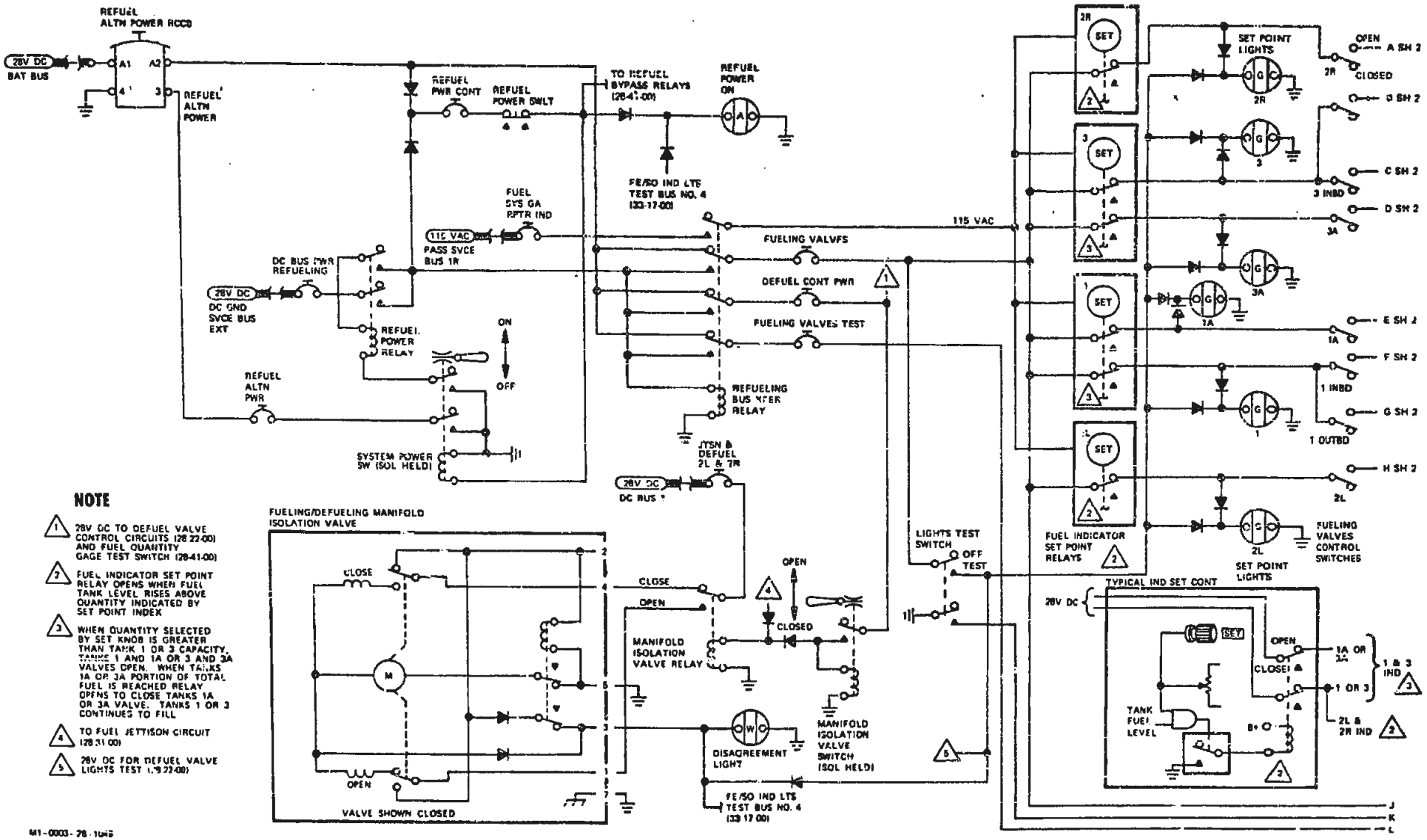
C. Alternate Power Operation

Placing the SYSTEM POWER switch ON when only battery bus power is available completes a circuit through the REFUEL

ALTN PWR circuit breaker on the galley right circuit breaker panel to energize the REFUEL ALTN POWER remote control circuit breaker. This action applies 28V DC BAT BUS power through the normally closed contacts of the deenergized refueling bus transfer relay (Ref. Fig. 10) to the defuel valve, fueling valve, and fueling valve test circuit breakers. 28V dc BAT BUS power is simultaneously applied through the REFUEL PWR CONT circuit breaker and REFUEL POWER switchlight to establish the solenoid hold circuit that keeps the SYSTEM POWER switch latched in.

The fueling/defueling manifold isolation valve is dependent on power from DC BUS 1 and is therefore not electrically operable when only battery bus power is used. The valve, however, may be manually opened if required.

The fueling valve control circuitry, when using only dc battery bus power, operates as described under Paragraph 8A.



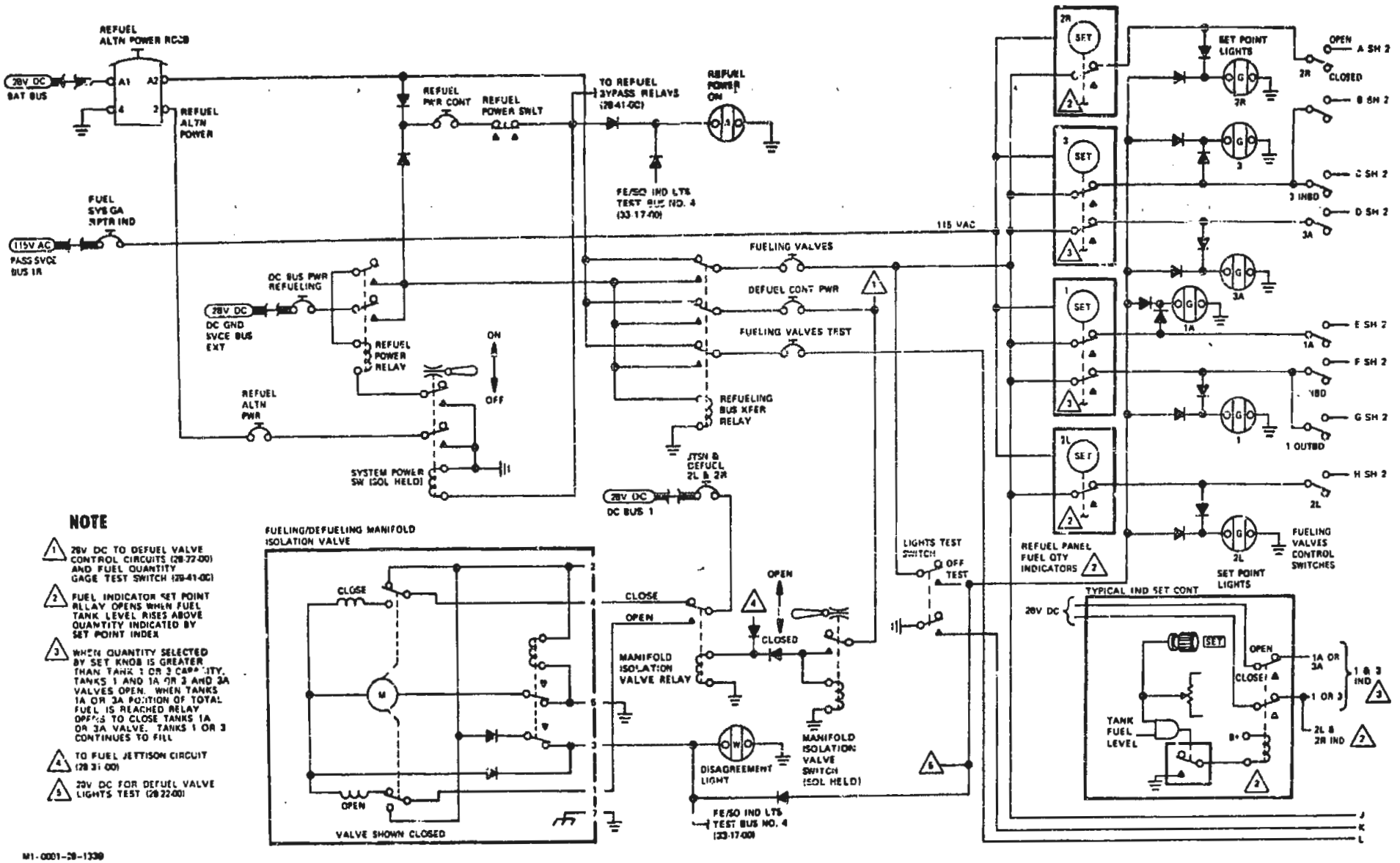
NOTE

1. 28V DC TO DEFUEL VALVE CONTROL CIRCUITS (28-22-00) AND FUEL QUANTITY GAGE TEST SWITCH (28-41-00)
2. FUEL INDICATOR SET POINT RELAY OPENS WHEN FUEL TANK LEVEL RISES ABOVE QUANTITY INDICATED BY SET POINT INDEX
3. WHEN QUANTITY SELECTED BY SET KNOB IS GREATER THAN TANK 1 OR 3 CAPACITY, TANKS 1 AND 1A OR 3 AND 3A VALVES OPEN. WHEN TANKS 1A OR 3A PORTION OF TOTAL FUEL IS REACHED RELAY OPENS TO CLOSE TANKS 1A OR 3A VALVE. TANKS 1 OR 3 CONTINUES TO FILL
4. TO FUEL JETTISON CIRCUIT (28-31-00)
5. 28V DC FOR DEFUEL VALVE LIGHTS TEST (28-22-00)

M1-0003-28-1048

R Pressure Fueling System Simplified Schematic
R Figure 10 (Sheet 1)

EFFECTIVITY: 025-026, 028-031 WITHOUT SB28-056



NOTE

1. 28V DC TO DEFUEL VALVE CONTROL CIRCUITS (28-22-00) AND FUEL QUANTITY GAGE TEST SWITCH (28-41-00)
2. FUEL INDICATOR SET POINT RELAY OPENS WHEN FUEL TANK LEVEL RISES ABOVE QUANTITY INDICATED BY SET POINT INDEX
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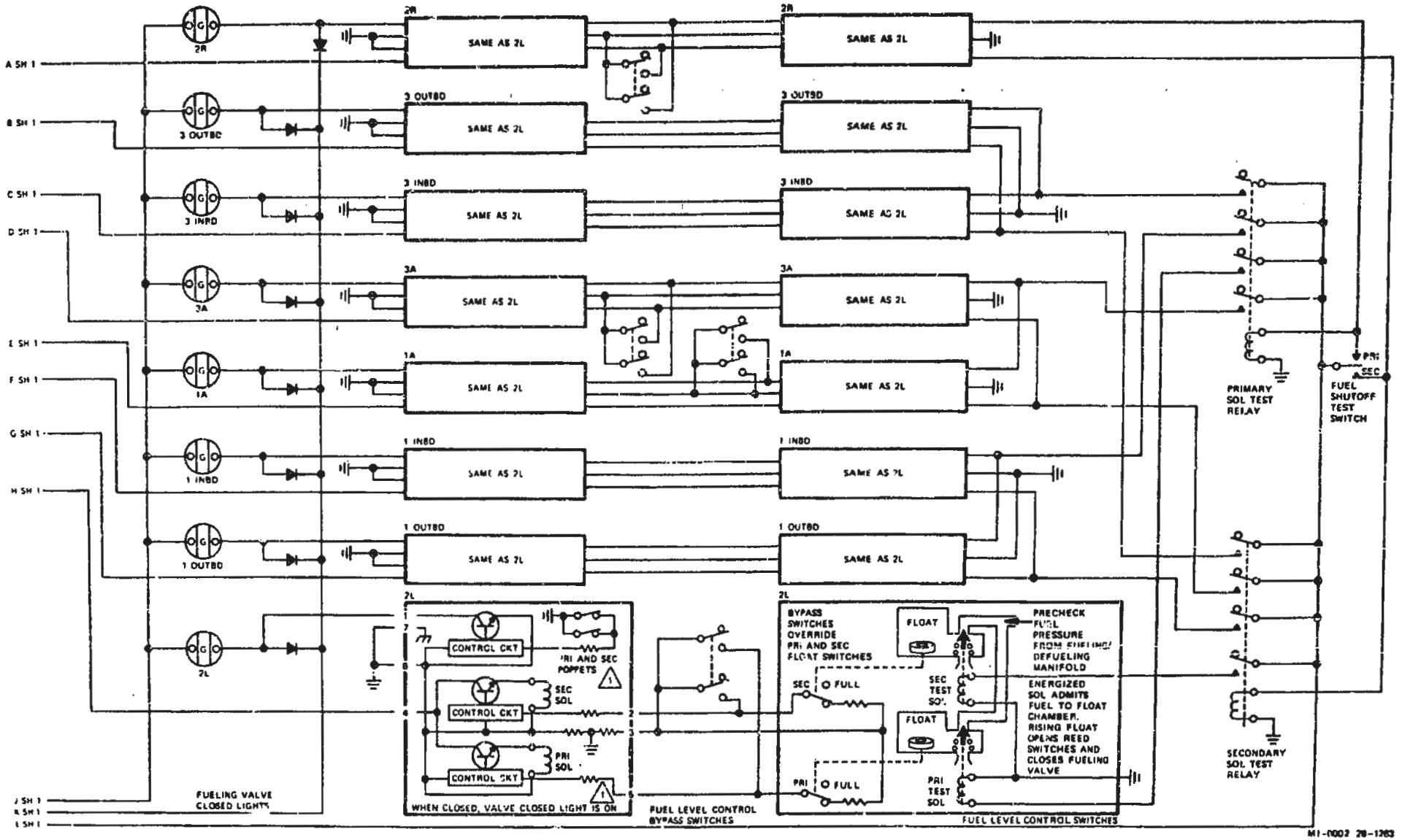
4. TO FUEL JETTISON CIRCUIT (28-31-00)
5. 28V DC FOR DEFUEL VALVE LIGHTS TEST (28-22-00)

M1-0001-28-1330

Pressure Fueling System Simplified Schematic
Figure 10 (Sheet 1)

R EFFECTIVITY: 025-026, 028-031 WITH SB28-056,
R 032-999

0028



Pressure Fueling System Simplified Schematic
Figure 10 (Sheet 2)

R PRESSURE FUELING - FAULT ISOLATION

R 1. General

R Reference data and fault isolation procedures for troubleshooting pressure fueling system faults are included in this section of the manual. A fueling system malfunction detected by the flight crew is normally entered in the aircraft flight log book and reported to maintenance personnel by a FIRM fault code number. This number and the flight log book write-up can be found in the Chapter 28 Fault Code Index. The index specifies the maintenance manual section, fault isolation diagram figure number and, where appropriate, a block number indicating the diagram entry point containing the fault isolation procedure. When no block number is specified, the diagram entry point is block 1.

R Prerequisites listed at the top of each diagram identify mandatory preliminary steps and circuit breakers that must be closed before initiating any fault isolation step.

R Schematic diagrams, identified by a SCHEM number, supplement fault isolation procedures as maintenance aids. The schematics show the basic system circuitry necessary for troubleshooting and include cross-reference indexes to the wiring diagram manual pages required for checking component interconnect wiring.

R 2. Fault Isolation

R Table 101 is a list of fault isolation data in this section of the manual.

Fault Isolation Data
Table 101

	FIGURE NUMBER	TITLE
	101	Component Locator Index
	102	Component Locator
	103	Tank 1/3 Fueling Valve Does Not Open
	104	Tank 2L/2R Fueling Valve Does Not Open
	105	Fueling Valve Fails To Close
	106	ISOLATION VALVE Amber Disagreement Light Problems
	107	SET POINT or VALVE CLOSED Lights Check Out
R	108	Indicator Light Assembly Fault Details
	SCHEM 1	Pressure Fueling System Schematic
	SCHEM 2	Fueling Manifold Isolation Valve Schematic

COMPONENT	QTY	AREA/ACCESS	REFERENCE
ADAPTER, PRESSURE FUELING HOSE	1	WING LE, 521/621FB	28-21-07
CIRCUIT BREAKERS			
DC BUS PWR REFUEL (2821-CB8	1	GALLEY LEFT CB PNL	*
FUEL SYS GA RPTR IND (2821-CB2)	1	GALLEY RIGHT CB PNL	*
FUEL VALVES – TEST (2821-CB4)	1	GALLEY RIGHT CB PNL	*
FUEL VALVES (2820-CB2)	1	GALLEY RIGHT CB PNL	*
REFUEL PWR CONT (2821-CB1)	1	GALLEY RIGHT CB PNL	*
REFUEL ALTN PWR (2821-CB7)	1	GALLEY RIGHT CB PNL	*
GAGE, FUEL LEVEL SIGHT			
TANK 1, 2L, 2R, 3	12	LWR WING SURFACE	28-41-24
PANEL			
FUELING/DEFUELING	1	RT WING LE/621FB	28-21-99
RELAY			
REFUEL POWER (2821-K4)	1	MESC/192K, 137AZ, 132FR	*
REFUEL BUS XFR (2821-K1)	1	MESC/192K, 137AZ, 132FR	*
PRIMARY SOL TEST (2821-K3)	1	MESC/192K, 137AZ, 132FR	*
SECONDARY SOL TEST (2821-K2)	1	MESC/192K, 137AZ, 132FR	*
SWITCH			
FUEL LEVEL CONTROL (2L/2R)	2	UPPER WING SURFACE, 531/631AT	28-21-07
FUEL LEVEL CONTROL (1/3)	4	UPPER WING SURFACE, 531/631AT	28-21-07
FUEL LEVEL CONTROL BYPASS (2L/2R)	2	WING LE, 521/621GB	*
VALVE			
FUELING (1/3)	4	WING LE, 541/641EB	28-21-10
FUELING (2L/2R)	2	WING LE, 521/621HB	28-21-10
MANIFOLD ISOLATION	1	HSC, CTR SECT BEAM, 147AB	28-21-03

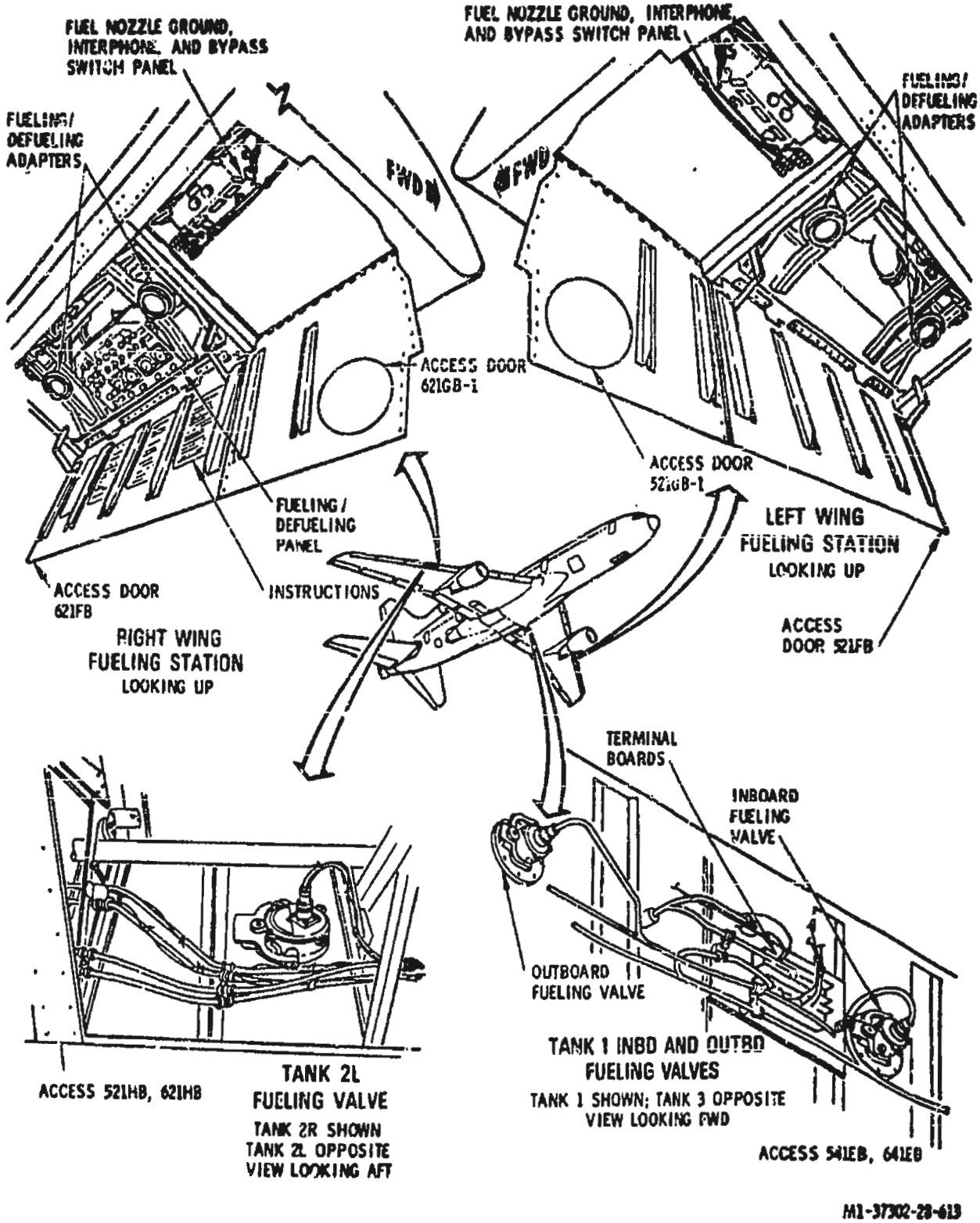
*SEE WM EQUIPMENT LIST

M1--0002-28-1635

R
R

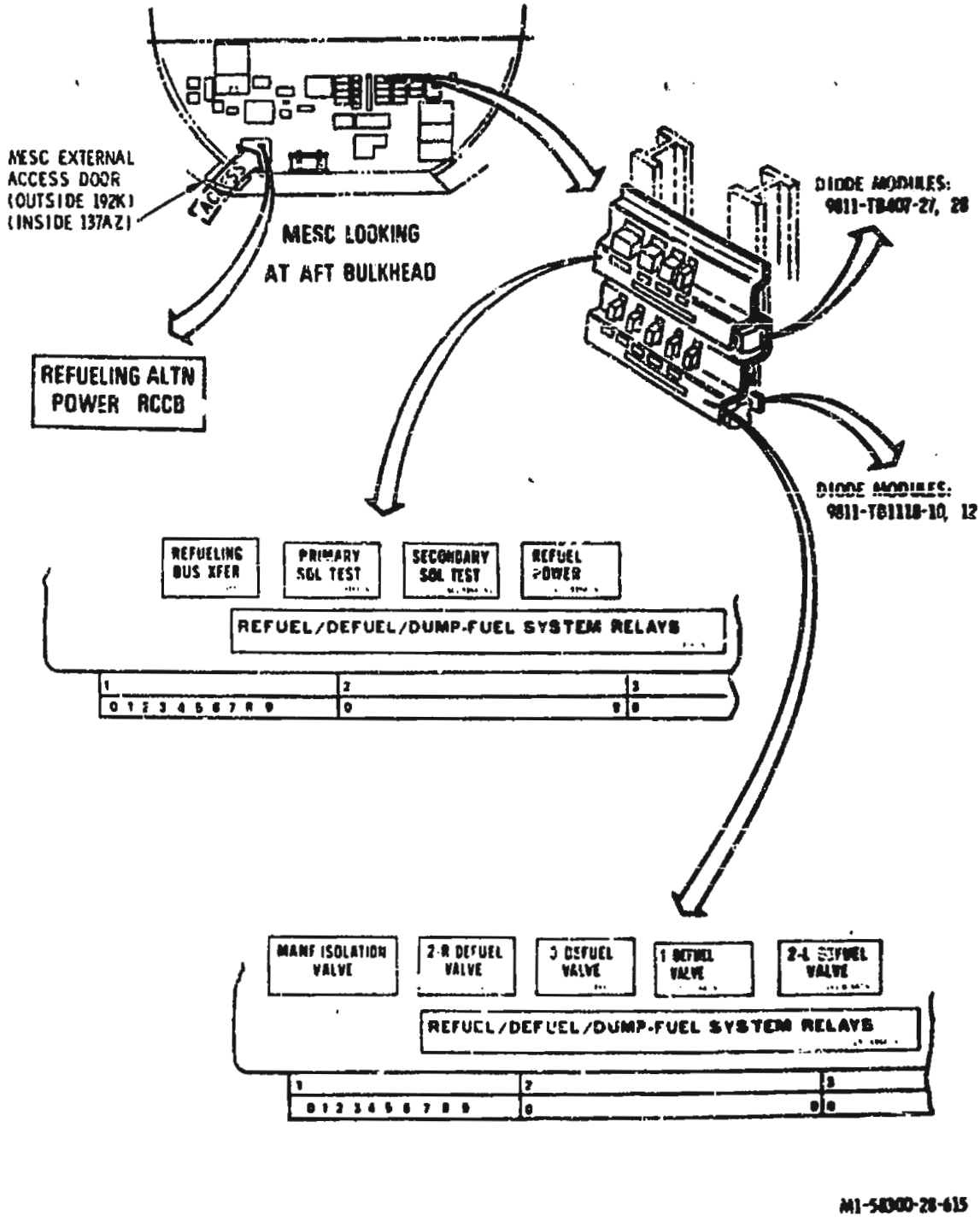
Component Locator Index
Figure 101

EFFECTIVITY: 001-024, 027


FUEL NOZZLE GROUND, INTERPHONE, AND BYPASS SWITCH PANEL
FUELING/ DEFUELING ADAPTERS
FWD
ACCESS DOOR 621GB-1
FUELING/ DEFUELING PANEL
INSTRUCTIONS
ACCESS DOOR 621FB
RIGHT WING FUELING STATION LOOKING UP
FUEL NOZZLE GROUND, INTERPHONE, AND BYPASS SWITCH PANEL
FUELING/ DEFUELING ADAPTERS
FWD
ACCESS DOOR 521GB-1
LEFT WING FUELING STATION LOOKING UP
ACCESS DOOR 521FB
TERMINAL BOARDS
INBOARD FUELING VALVE
OUTBOARD FUELING VALVE
TANK 1 INBD AND OUTBD FUELING VALVES
TANK 1 SHOWN; TANK 3 OPPOSITE VIEW LOOKING FWD
ACCESS 541EB, 641EB
ACCESS 521HB, 621HB
TANK 2L FUELING VALVE
TANK 2R SHOWN TANK 2L OPPOSITE VIEW LOOKING AFT
M1-37302-28-613

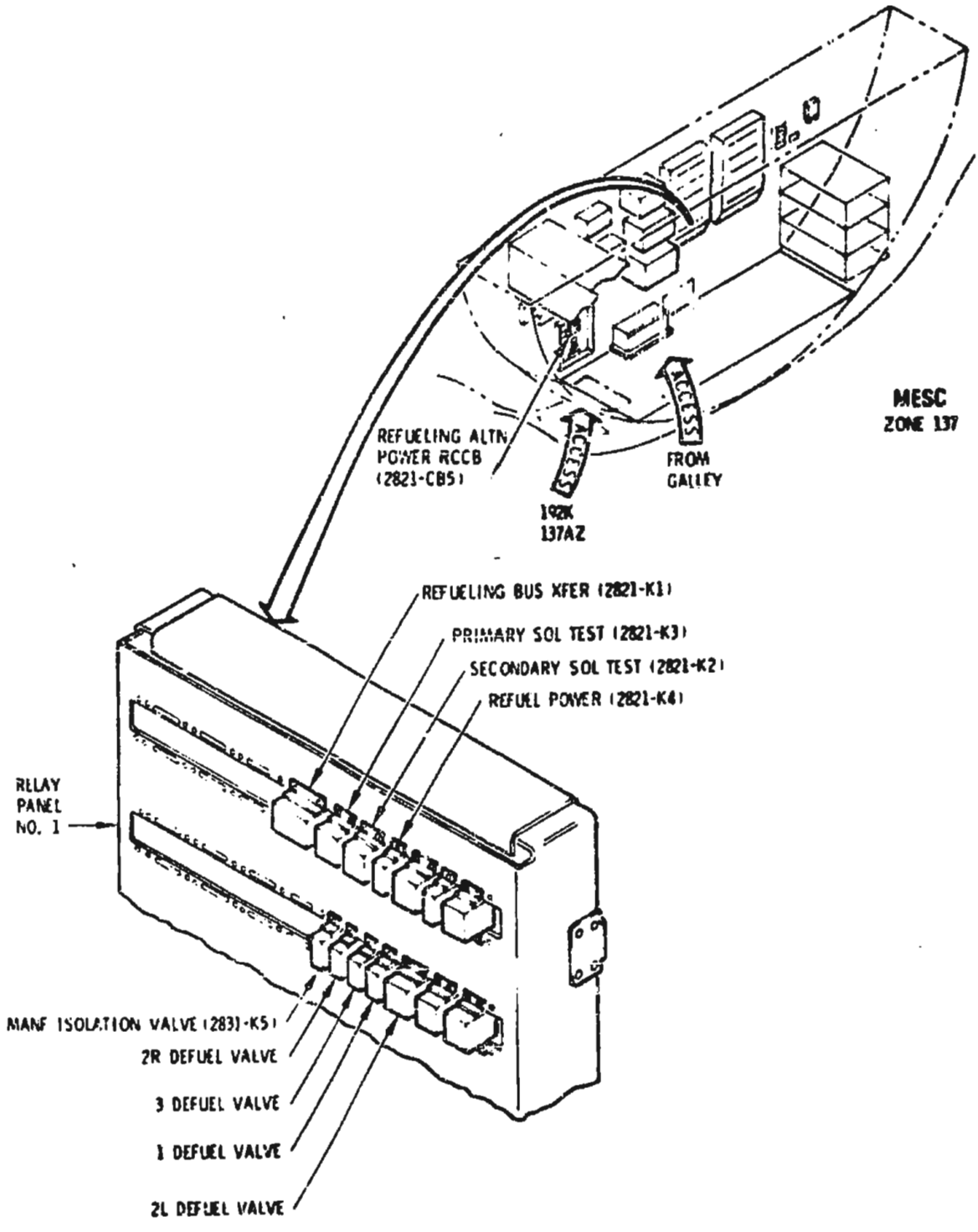
R Pressure Fueling System Component Locator
R Figure 102 (Sheet 1)

EFFECTIVITY: 001-024, 027



R Pressure Fueling System Component Locator
R Figure 102 (Sheet 2)

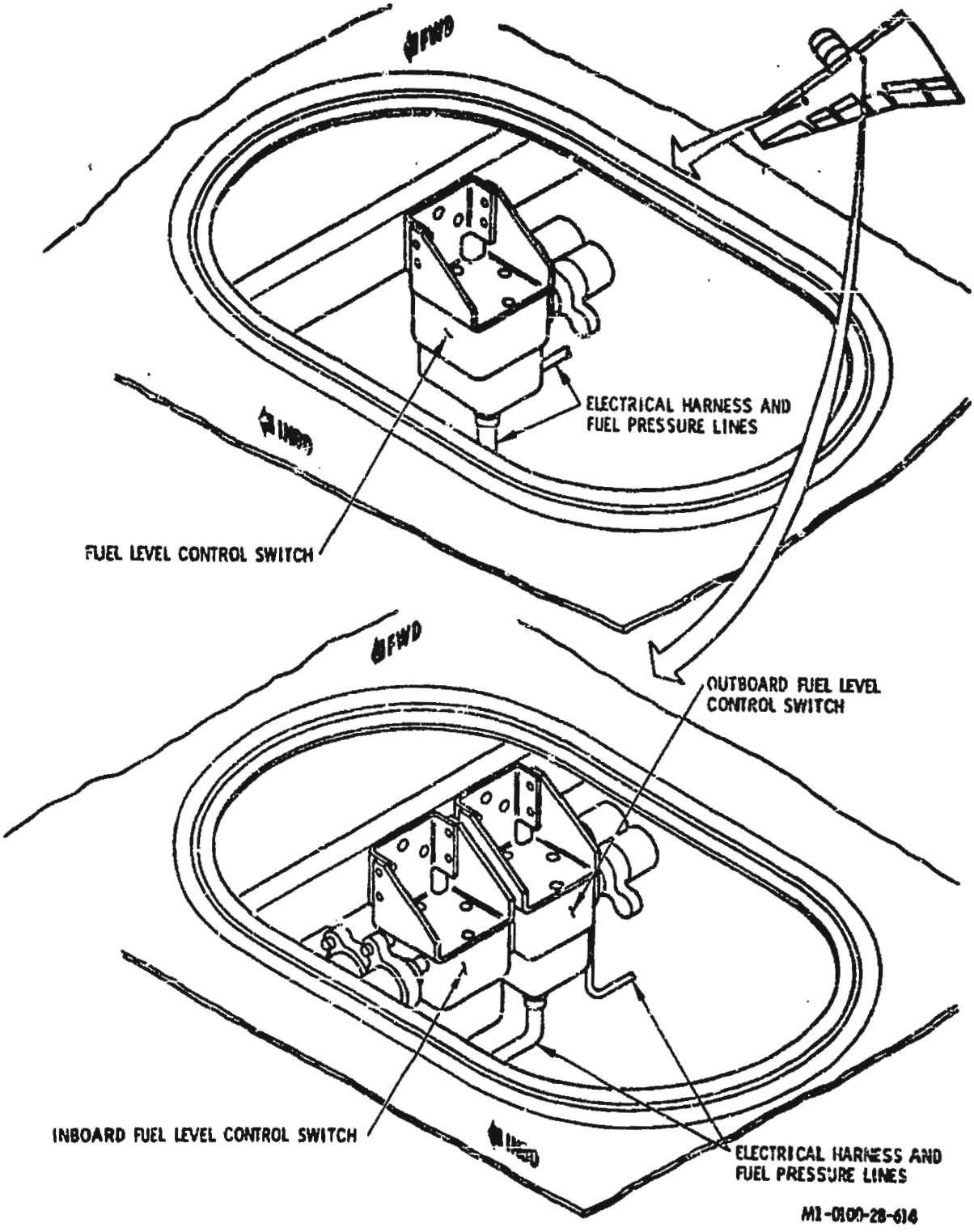
EFFECTIVITY: 001-023



Pressure Fueling System Component Locator
Figure 102 (Sheet 3)

R

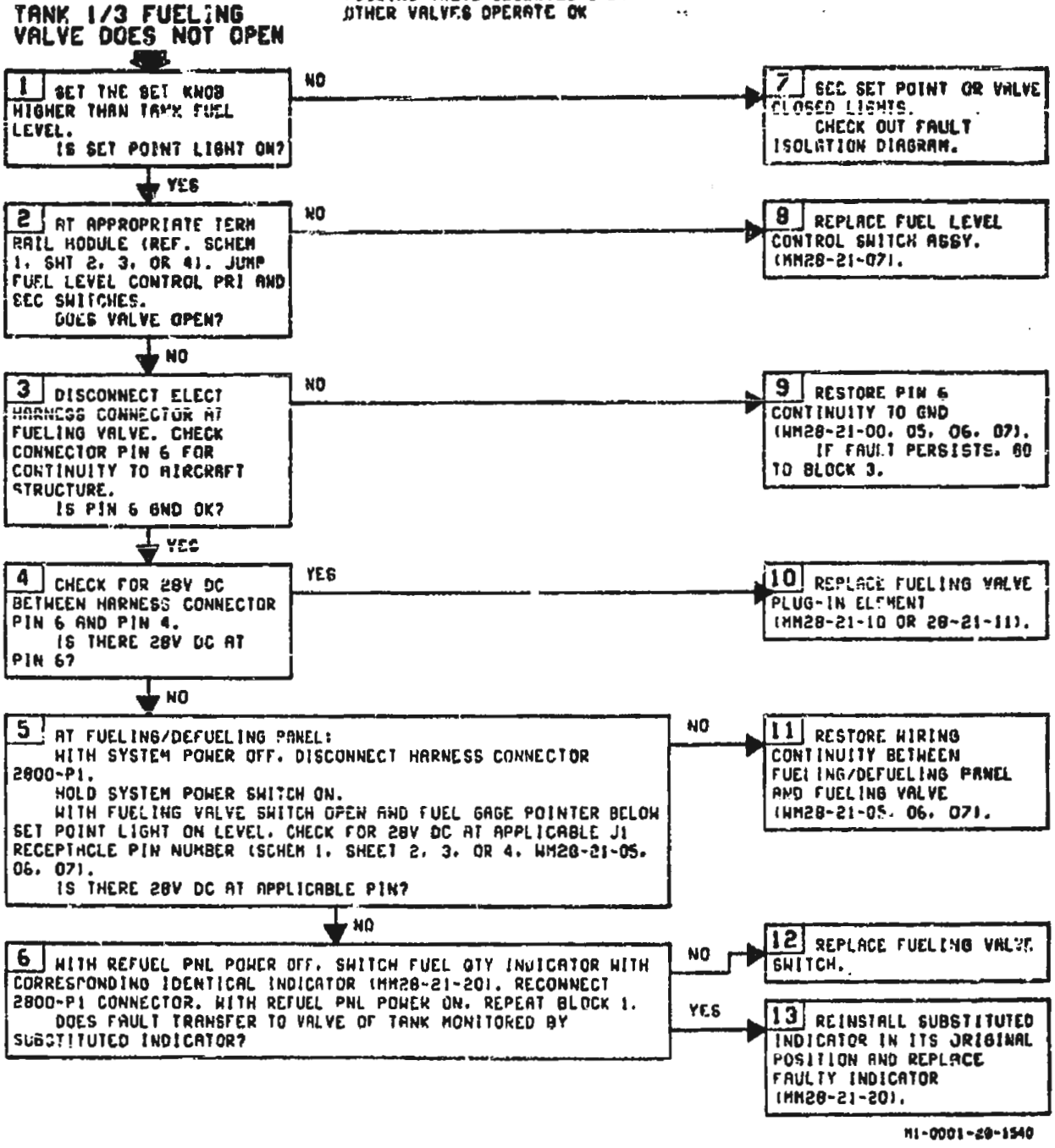
EFFECTIVITY: 024, 027



Pressure Fueling System Component Locator
Figure 102 (Sheet 4)

R

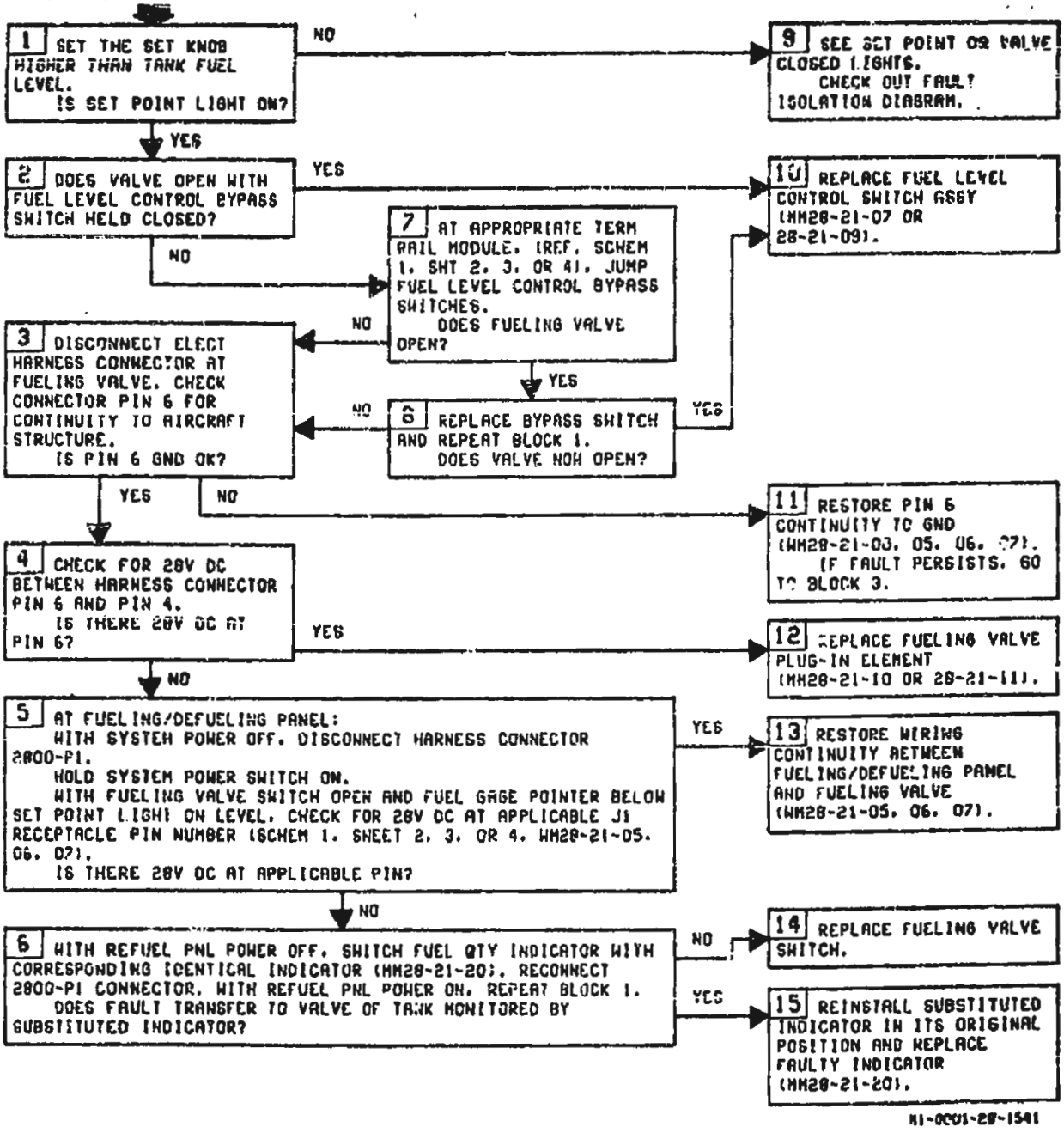
PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: GALLEY LEFT - 21N
GALLEY RIGHT - 16N, 17N, 18N
REFUELING PRESSURE APPLIED TO FUELING VALVES
REFUEL PNL SYSTEM POWER SW LATCHED ON
FUELING VALVE SELECTED OPEN
OTHER VALVES OPERATE OK


TANK 1/3 FUELING VALVE DOES NOT OPEN
1 SET THE SET KNOB HIGHER THAN TANK FUEL LEVEL.
IS SET POINT LIGHT ON?
NO
7 SEE SET POINT OR VALVE CLOSED LIGHTS.
CHECK OUT FAULT ISOLATION DIAGRAM.
YES
2 AT APPROPRIATE TERM RAIL MODULE (REF. SCHEM 1, SHT 2, 3, OR 4), JUMP FUEL LEVEL CONTROL PRI AND SEC SWITCHES.
DOES VALVE OPEN?
NO
8 REPLACE FUEL LEVEL CONTROL SWITCH ASSY. (MM28-21-07).
NO
3 DISCONNECT ELECT HARNESS CONNECTOR AT FUELING VALVE. CHECK CONNECTOR PIN 6 FOR CONTINUITY TO AIRCRAFT STRUCTURE.
IS PIN 6 GND OK?
NO
9 RESTORE PIN 6 CONTINUITY TO GND (MM28-21-00, 05, 06, 07).
IF FAULT PERSISTS, GO TO BLOCK 3.
YES
4 CHECK FOR 28V DC BETWEEN HARNESS CONNECTOR PIN 6 AND PIN 4.
IS THERE 28V DC AT PIN 6?
YES
10 REPLACE FUELING VALVE PLUG-IN ELEMENT (MM28-21-10 OR 28-21-11).
NO
5 AT FUELING/DEFUELING PANEL:
WITH SYSTEM POWER OFF, DISCONNECT HARNESS CONNECTOR 2800-P1.
HOLD SYSTEM POWER SWITCH ON.
WITH FUELING VALVE SWITCH OPEN AND FUEL GAGE POINTER BELOW SET POINT LIGHT ON LEVEL, CHECK FOR 28V DC AT APPLICABLE J1 RECEPTACLE PIN NUMBER (SCHEM 1, SHEET 2, 3, OR 4, MM28-21-05, 06, 07).
IS THERE 28V DC AT APPLICABLE PIN?
NO
11 RESTORE WIRING CONTINUITY BETWEEN FUELING/DEFUELING PANEL AND FUELING VALVE (MM28-21-05, 06, 07).
NO
6 WITH REFUEL PNL POWER OFF, SWITCH FUEL QTY INDICATOR WITH CORRESPONDING IDENTICAL INDICATOR (MM28-21-20). RECONNECT 2800-P1 CONNECTOR. WITH REFUEL PNL POWER ON, REPEAT BLOCK 1.
DOES FAULT TRANSFER TO VALVE OF TANK MONITORED BY SUBSTITUTED INDICATOR?
NO
12 REPLACE FUELING VALVE SWITCH.
YES
13 REINSTALL SUBSTITUTED INDICATOR IN ITS ORIGINAL POSITION AND REPLACE FAULTY INDICATOR (MM28-21-20).
M1-0001-28-1540

Tank 1/3 Fueling Valve Does Not Open
Figure 103

PREREQUISITES
ELECTRICAL POWER (HM24-00-00)
CB'S: GALLEY LEFT - 21B
GALLEY RIGHT - 16H, 17H, 18H
REFUELING PRESSURE APPLIED TO FUELING VALVES
REFUEL PNL SYSTEM POWER SW LATCHED ON
FUELING VALVE SELECTED OPEN
OTHER VALVES OPERATE OK

TANK 2L/2R FUELING VALVE DOES NOT OPEN

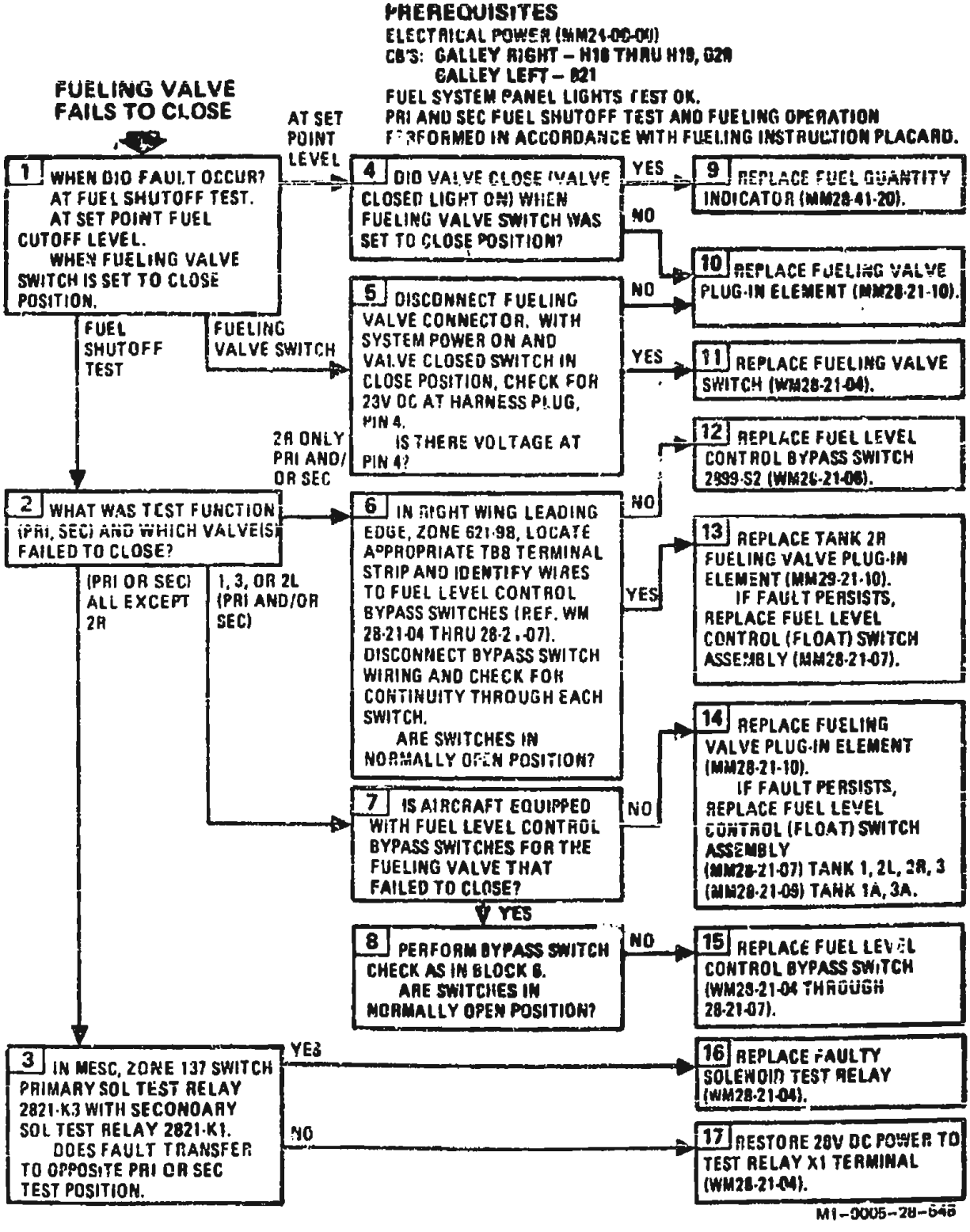

1 SET THE SET KNOB HIGHER THAN TANK FUEL LEVEL. IS SET POINT LIGHT ON?
NO
9 SEE SET POINT OR VALVE CLOSED LIGHTS. CHECK OUT FAULT ISOLATION DIAGRAM.
YES
2 DOES VALVE OPEN WITH FUEL LEVEL CONTROL BYPASS SWITCH HELD CLOSED?
YES
10 REPLACE FUEL LEVEL CONTROL SWITCH ASSY (HM28-21-07 OR 28-21-09).
NO
7 AT APPROPRIATE TERM RAIL MODULE, (REF. SCHEM 1, SHT 2, 3, OR 4), JUMP FUEL LEVEL CONTROL BYPASS SWITCHES. DOES FUELING VALVE OPEN?
NO
3 DISCONNECT ELECT HARNESS CONNECTOR AT FUELING VALVE. CHECK CONNECTOR PIN 6 FOR CONTINUITY TO AIRCRAFT STRUCTURE. IS PIN 6 GND OK?
YES
8 REPLACE BYPASS SWITCH AND REPEAT BLOCK 1. DOES VALVE NOW OPEN?
NO
YES
YES
NO
11 RESTORE PIN 6 CONTINUITY TO GND (HM28-21-03, 05, 06, 07). IF FAULT PERSISTS, GO TO BLOCK 3.
4 CHECK FOR 28V DC BETWEEN HARNESS CONNECTOR PIN 6 AND PIN 4. IS THERE 28V DC AT PIN 6?
YES
12 REPLACE FUELING VALVE PLUG-IN ELEMENT (HM28-21-10 OR 28-21-11).
NO
5 AT FUELING/DEFUELING PANEL: WITH SYSTEM POWER OFF, DISCONNECT HARNESS CONNECTOR 2800-P1. HOLD SYSTEM POWER SWITCH ON. WITH FUELING VALVE SWITCH OPEN AND FUEL GAGE POINTER BELOW SET POINT LIGHT ON LEVEL, CHECK FOR 28V DC AT APPLICABLE J1 RECEPTACLE PIN NUMBER (SCHEM 1, SHEET 2, 3, OR 4, HM28-21-05, 06, 07). IS THERE 28V DC AT APPLICABLE PIN?
YES
13 RESTORE WIRING CONTINUITY BETWEEN FUELING/DEFUELING PANEL AND FUELING VALVE (HM28-21-05, 06, 07).
NO
6 WITH REFUEL PNL POWER OFF, SWITCH FUEL QTY INDICATOR WITH CORRESPONDING IDENTICAL INDICATOR (HM28-21-20). RECONNECT 2800-P1 CONNECTOR. WITH REFUEL PNL POWER ON, REPEAT BLOCK 1. DOES FAULT TRANSFER TO VALVE OF TANK MONITORED BY SUBSTITUTED INDICATOR?
NO
14 REPLACE FUELING VALVE SWITCH.
YES
15 REINSTALL SUBSTITUTED INDICATOR IN ITS ORIGINAL POSITION AND REPLACE FAULTY INDICATOR (HM28-21-20).

M1-0001-28-1541

Tank 2L/2R Fueling Valve Does Not Open
Figure 104

R EFFECTIVITY: 001-024, 027
R

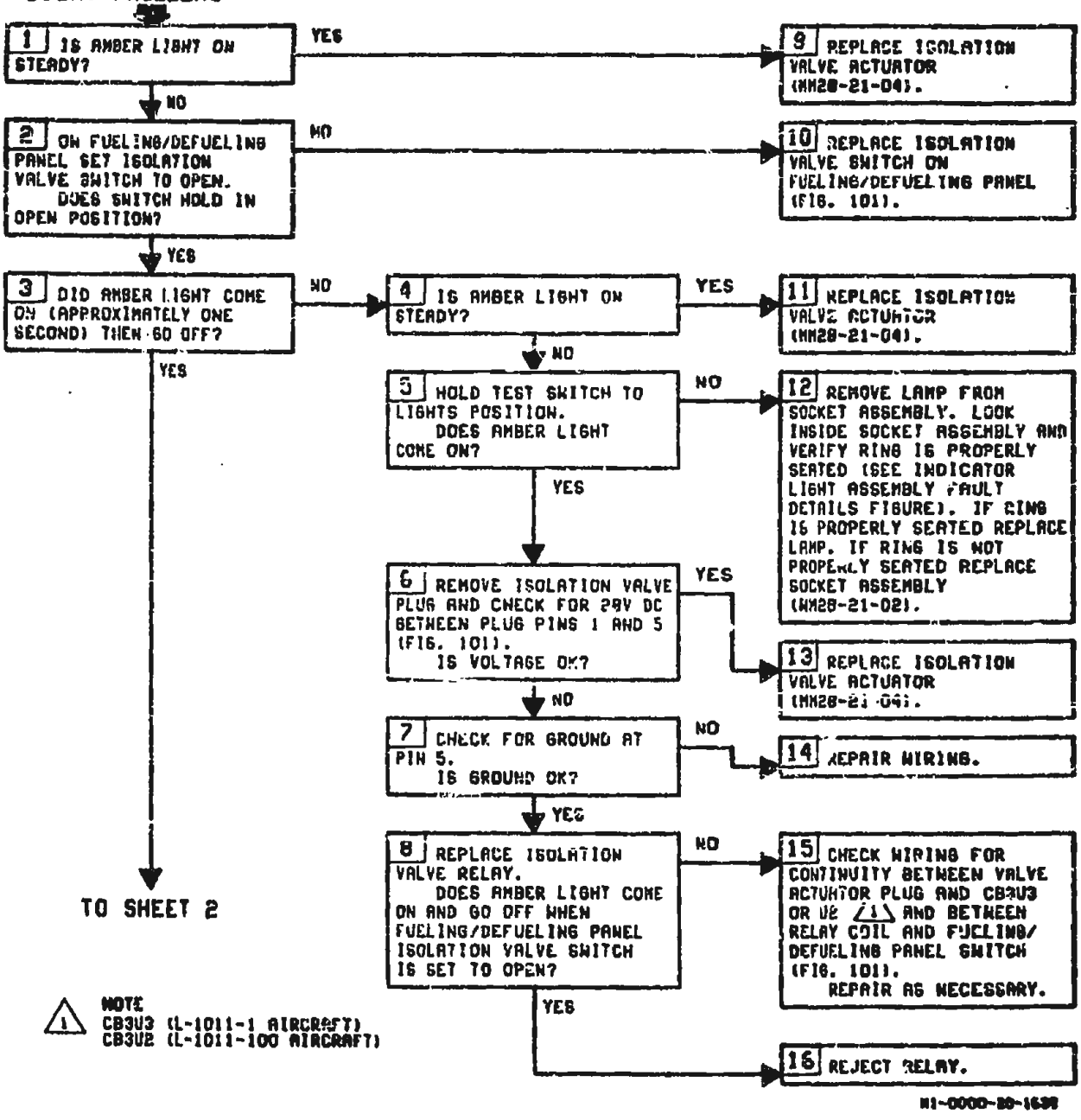
001B


PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: GALLEY RIGHT – H18 THRU H19, G20
GALLEY LEFT – B21
FUEL SYSTEM PANEL LIGHTS TEST OK.
PRI AND SEC FUEL SHUTOFF TEST AND FUELING OPERATION PERFORMED IN ACCORDANCE WITH FUELING INSTRUCTION PLACARD.
FUELING VALVE FAILS TO CLOSE
1 WHEN DID FAULT OCCUR?
AT FUEL SHUTOFF TEST.
AT SET POINT FUEL CUTOFF LEVEL.
WHEN FUELING VALVE SWITCH IS SET TO CLOSE POSITION.
FUEL SHUTOFF TEST
FUELING VALVE SWITCH
AT SET POINT LEVEL
2 WHAT WAS TEST FUNCTION (PRI, SEC) AND WHICH VALVE(S) FAILED TO CLOSE?
(PRI OR SEC) ALL EXCEPT 2R
1, 3, OR 2L (PRI AND/OR SEC)
2R ONLY PRI AND/OR SEC
3 IN MESC, ZONE 137 SWITCH PRIMARY SOL TEST RELAY 2821-K3 WITH SECONDARY SOL TEST RELAY 2821-K1.
DOES FAULT TRANSFER TO OPPOSITE PRI OR SEC TEST POSITION.
YES
NO
4 DID VALVE CLOSE (VALVE CLOSED LIGHT ON) WHEN FUELING VALVE SWITCH WAS SET TO CLOSE POSITION?
5 DISCONNECT FUELING VALVE CONNECTOR. WITH SYSTEM POWER ON AND VALVE CLOSED SWITCH IN CLOSE POSITION, CHECK FOR 23V DC AT HARNESS PLUG, PIN 4.
IS THERE VOLTAGE AT PIN 4?
6 IN RIGHT WING LEADING EDGE, ZONE 621-98, LOCATE APPROPRIATE TB8 TERMINAL STRIP AND IDENTIFY WIRES TO FUEL LEVEL CONTROL BYPASS SWITCHES (REF. WM 28-21-04 THRU 28-21-07). DISCONNECT BYPASS SWITCH WIRING AND CHECK FOR CONTINUITY THROUGH EACH SWITCH.
ARE SWITCHES IN NORMALLY OPEN POSITION?
7 IS AIRCRAFT EQUIPPED WITH FUEL LEVEL CONTROL BYPASS SWITCHES FOR THE FUELING VALVE THAT FAILED TO CLOSE?
8 PERFORM BYPASS SWITCH CHECK AS IN BLOCK 6.
ARE SWITCHES IN NORMALLY OPEN POSITION?
9 REPLACE FUEL QUANTITY INDICATOR (MM28-41-20).
10 REPLACE FUELING VALVE PLUG-IN ELEMENT (MM28-21-10).
11 REPLACE FUELING VALVE SWITCH (WM28-21-04).
12 REPLACE FUEL LEVEL CONTROL BYPASS SWITCH 2899-S2 (WM28-21-06).
13 REPLACE TANK 2R FUELING VALVE PLUG-IN ELEMENT (MM29-21-10).
IF FAULT PERSISTS, REPLACE FUEL LEVEL CONTROL (FLOAT) SWITCH ASSEMBLY (MM28-21-07).
14 REPLACE FUELING VALVE PLUG-IN ELEMENT (MM28-21-10).
IF FAULT PERSISTS, REPLACE FUEL LEVEL CONTROL (FLOAT) SWITCH ASSEMBLY (MM28-21-07) TANK 1, 2L, 2R, 3 (MM28-21-09) TANK 1A, 3A.
15 REPLACE FUEL LEVEL CONTROL BYPASS SWITCH (WM28-21-04 THROUGH 28-21-07).
16 REPLACE FAULTY SOLENOID TEST RELAY (WM28-21-04).
17 RESTORE 28V DC POWER TO TEST RELAY X1 TERMINAL (WM28-21-04).
M1-0005-28-648

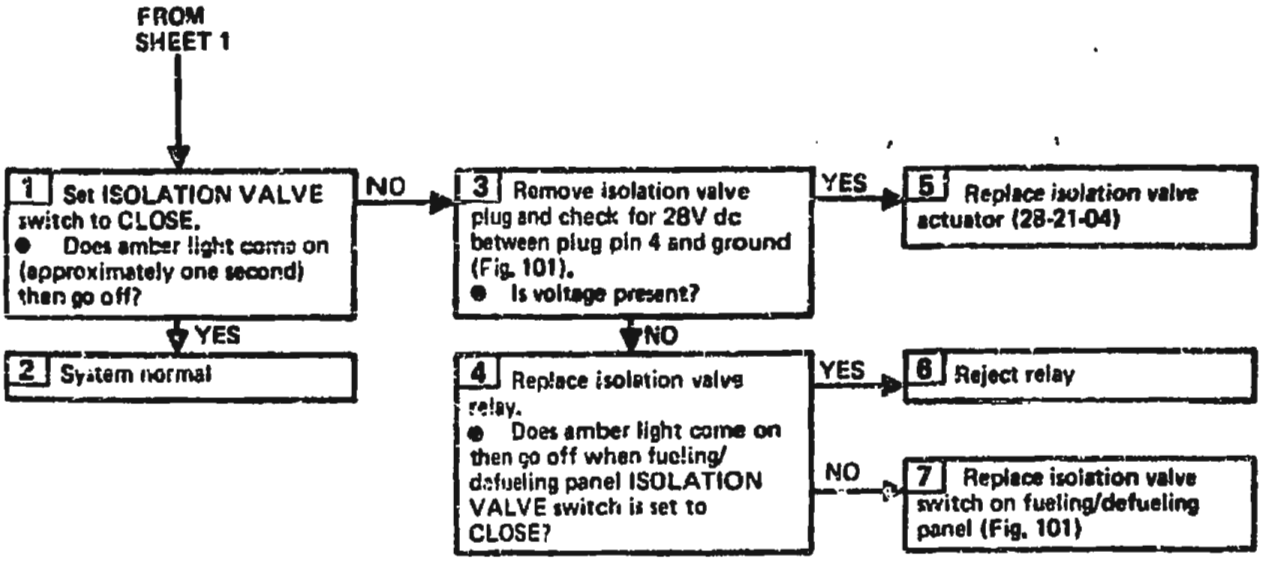
R Fueling Valve Fails To Close
R Figure 105

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S IN: GALLEY RIGHT- H16 THRU H19, B20
GALLEY LEFT- B21
CB3-U2
ON FUELING/DEFUELING PANEL SET SYSTEM POWER SWITCH TO ON. VERIFY SWITCH HOLDS ON

ISOLATION VALVE AMBER DISAGREEMENT LIGHT PROBLEMS


1 IS AMBER LIGHT ON STEADY?
YES
9 REPLACE ISOLATION VALVE ACTUATOR (MM28-21-04).
NO
2 ON FUELING/DEFUELING PANEL SET ISOLATION VALVE SWITCH TO OPEN. DOES SWITCH HOLD IN OPEN POSITION?
NO
10 REPLACE ISOLATION VALVE SWITCH ON FUELING/DEFUELING PANEL (FIG. 101).
YES
3 DID AMBER LIGHT COME ON (APPROXIMATELY ONE SECOND) THEN GO OFF?
NO
4 IS AMBER LIGHT ON STEADY?
YES
11 REPLACE ISOLATION VALVE ACTUATOR (MM28-21-04).
NO
5 HOLD TEST SWITCH TO LIGHTS POSITION. DOES AMBER LIGHT COME ON?
NO
12 REMOVE LAMP FROM SOCKET ASSEMBLY. LOOK INSIDE SOCKET ASSEMBLY AND VERIFY RING IS PROPERLY SEATED (SEE INDICATOR LIGHT ASSEMBLY FAULT DETAILS FIGURE). IF RING IS PROPERLY SEATED REPLACE LAMP. IF RING IS NOT PROPERLY SEATED REPLACE SOCKET ASSEMBLY (MM28-21-02).
YES
6 REMOVE ISOLATION VALVE PLUG AND CHECK FOR 28V DC BETWEEN PLUG PINS 1 AND 5 (FIG. 101). IS VOLTAGE OK?
YES
13 REPLACE ISOLATION VALVE ACTUATOR (MM28-21-04).
NO
7 CHECK FOR GROUND AT PIN 5. IS GROUND OK?
NO
14 REPAIR WIRING.
YES
8 REPLACE ISOLATION VALVE RELAY. DOES AMBER LIGHT COME ON AND GO OFF WHEN FUELING/DEFUELING PANEL ISOLATION VALVE SWITCH IS SET TO OPEN?
NO
15 CHECK WIRING FOR CONTINUITY BETWEEN VALVE ACTUATOR PLUG AND CB3U3 OR U2 (1) AND BETWEEN RELAY COIL AND FUELING/DEFUELING PANEL SWITCH (FIG. 101). REPAIR AS NECESSARY.
YES
16 REJECT RELAY.
TO SHEET 2
(1) NOTE
CB3U3 (L-1011-1 AIRCRAFT)
CB3U2 (L-1011-100 AIRCRAFT)
M1-0000-00-1638

R ISOLATION VALVE Amber Disagreement Light Problems
R Figure 106 (Sheet 1)

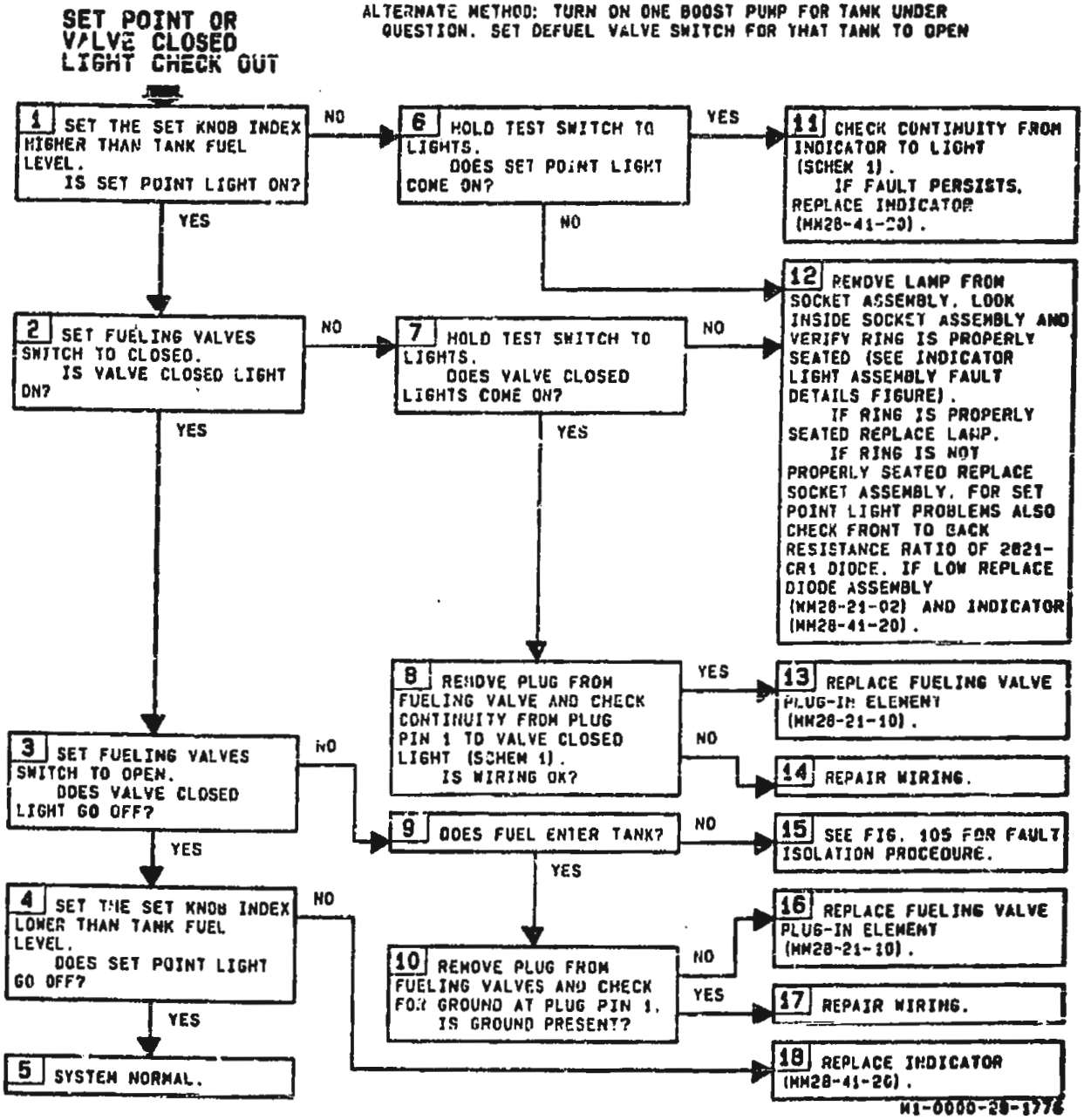

FROM SHEET 1
1 Set ISOLATION VALVE switch to CLOSE.
● Does amber light come on (approximately one second) then go off?
NO
3 Remove isolation valve plug and check for 28V dc between plug pin 4 and ground (Fig. 101).
● Is voltage present?
YES
5 Replace isolation valve actuator (28-21-04)
YES
2 System normal
NO
4 Replace isolation valve relay.
● Does amber light come on then go off when fueling/defueling panel ISOLATION VALVE switch is set to CLOSE?
YES
6 Reject relay
NO
7 Replace isolation valve switch on fueling/defueling panel (Fig. 101)

M1-0000-28-1615

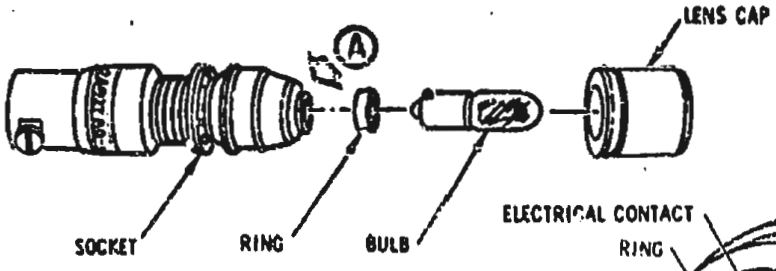
R ISOLATION VALVE Amber Disagreement Light Problems
R Figure 106 (Sheet 2)

EFFECTIVITY: 001-024, 027

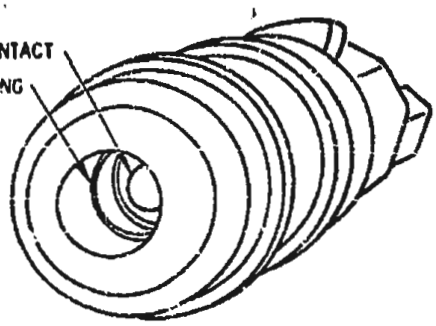
PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: CB3-U18
GALLEY RIGHT-H13 THRU H18, G20
GALLEY LEFT-G21
FUELING/DEFUELING PANEL:
SYSTEM POWER SWITCH SET TO ON, SWITCH HOLDS IN PLACE
FUEL SYSTEM PANEL: REFUEL POWER ON LIGHT ON
AT LEAST ONE FUELING HOSE CONNECTED TO FUELING ADAPTER AND PRESSURE APPLIED
ALTERNATE METHOD: TURN ON ONE BOOST PUMP FOR TANK UNDER QUESTION. SET DEFUEL VALVE SWITCH FOR THAT TANK TO OPEN


SET POINT OR VALVE CLOSED LIGHT CHECK OUT
1 SET THE SET KNOB INDEX HIGHER THAN TANK FUEL LEVEL. IS SET POINT LIGHT ON?
NO
6 HOLD TEST SWITCH TO LIGHTS. DOES SET POINT LIGHT COME ON?
YES
11 CHECK CONTINUITY FROM INDICATOR TO LIGHT (SCHEM 1). IF FAULT PERSISTS, REPLACE INDICATOR (MM28-41-20).
YES
NO
12 REMOVE LAMP FROM SOCKET ASSEMBLY. LOOK INSIDE SOCKET ASSEMBLY AND VERIFY RING IS PROPERLY SEATED (SEE INDICATOR LIGHT ASSEMBLY FAULT DETAILS FIGURE). IF RING IS PROPERLY SEATED REPLACE LAMP. IF RING IS NOT PROPERLY SEATED REPLACE SOCKET ASSEMBLY. FOR SET POINT LIGHT PROBLEMS ALSO CHECK FRONT TO BACK RESISTANCE RATIO OF 2021-CR1 DIODE. IF LOW REPLACE DIODE ASSEMBLY (MM28-21-02) AND INDICATOR (MM28-41-20).
2 SET FUELING VALVES SWITCH TO CLOSED. IS VALVE CLOSED LIGHT ON?
NO
7 HOLD TEST SWITCH TO LIGHTS. DOES VALVE CLOSED LIGHTS COME ON?
NO
YES
YES
8 REMOVE PLUG FROM FUELING VALVE AND CHECK CONTINUITY FROM PLUG PIN 1 TO VALVE CLOSED LIGHT (SCHEM 1). IS WIRING OK?
YES
13 REPLACE FUELING VALVE PLUG-IN ELEMENT (MM28-21-10).
NO
14 REPAIR WIRING.
3 SET FUELING VALVES SWITCH TO OPEN. DOES VALVE CLOSED LIGHT GO OFF?
NO
9 DOES FUEL ENTER TANK?
NO
15 SEE FIG. 105 FOR FAULT ISOLATION PROCEDURE.
YES
YES
4 SET THE SET KNOB INDEX LOWER THAN TANK FUEL LEVEL. DOES SET POINT LIGHT GO OFF?
NO
10 REMOVE PLUG FROM FUELING VALVES AND CHECK FOR GROUND AT PLUG PIN 1. IS GROUND PRESENT?
NO
16 REPLACE FUELING VALVE PLUG-IN ELEMENT (MM28-21-10).
YES
17 REPAIR WIRING.
YES
5 SYSTEM NORMAL.
18 REPLACE INDICATOR (MM28-41-20).
M1-0000-28-1776

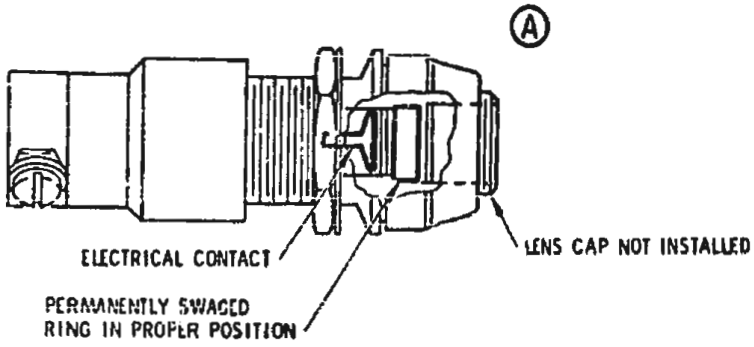
CR SET POINT or VALVE CLOSED Lights Check Out
CR Figure 107



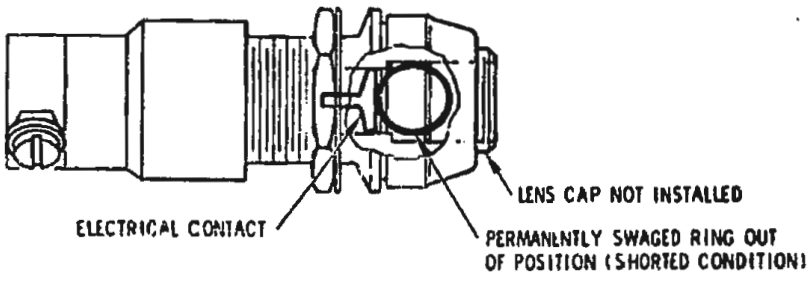
FUELING/DEFUELING PANEL INDICATOR LIGHT ASSEMBLY (TYPICAL)



FRONT VIEW - BULB AND LENS CAP REMOVED



INDICATOR LIGHT ASSEMBLY - CORRECT RING POSITION



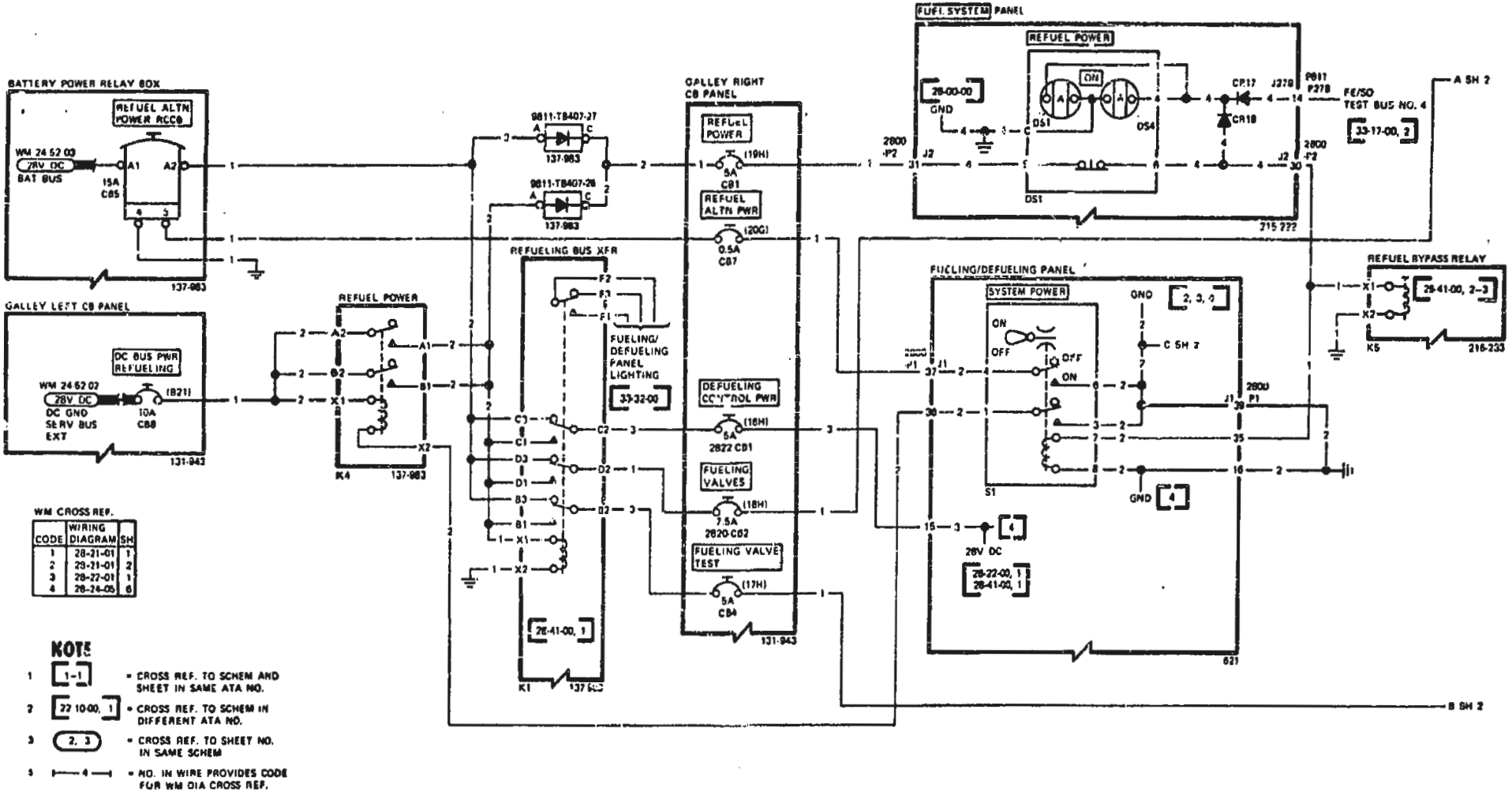
INDICATOR LIGHT ASSEMBLY - INCORRECT RING POSITION

M1-0000-28-1643

R Indicator Light Assembly Fault Details
R Figure 108

R EFFECTIVITY: 001-024, 027
R

001B



WM CROSS REF.

CODE	WIRING DIAGRAM	SH
1	28-21-01	1
2	28-21-01	2
3	28-22-01	1
4	28-24-05	6

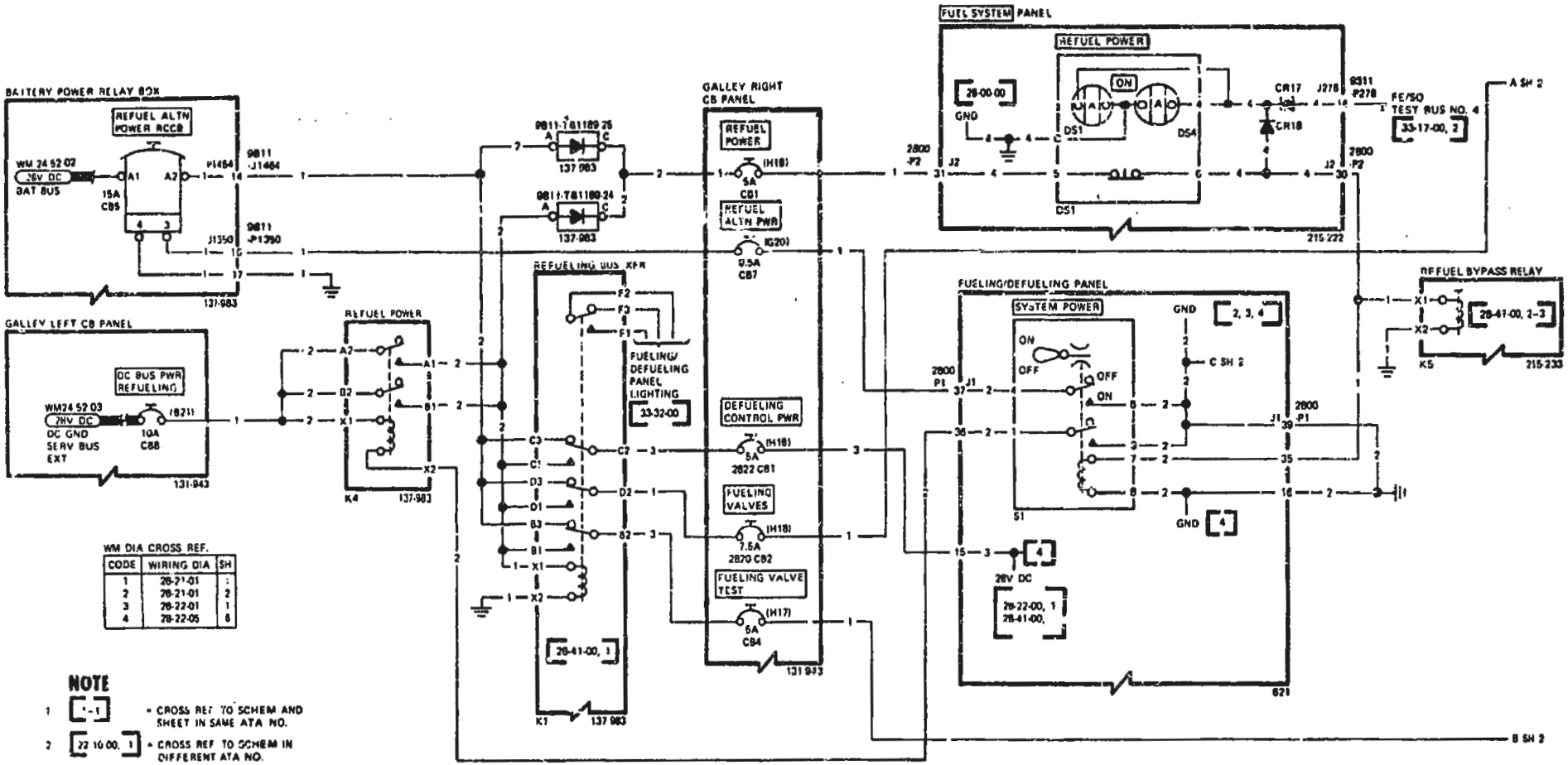
NOTE

1. [1-1] = CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2. [22 10-00, 1] = CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3. (2, 3) = CROSS REF. TO SHEET NO. IN SAME SCHEM
4. —4— = NO. IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.
5. SEE 22 INDEX FOR ABBREVIATIONS
6. ALL REF. DESIGNATIONS ARE PREFIXED WITH 2821 UNLESS OTHERWISE SPECIFIED

EM1-0003-28-627

Pressure Fueling System Schematic
SCHEM 1 (Sheet 1)

R EFFECTIVITY: 001-023
R



WM DIA CROSS REF.

CODE	WIRING DIA	SH
1	28-21-01	3
2	28-21-01	2
3	28-22-01	1
4	28-22-05	8

NOTE

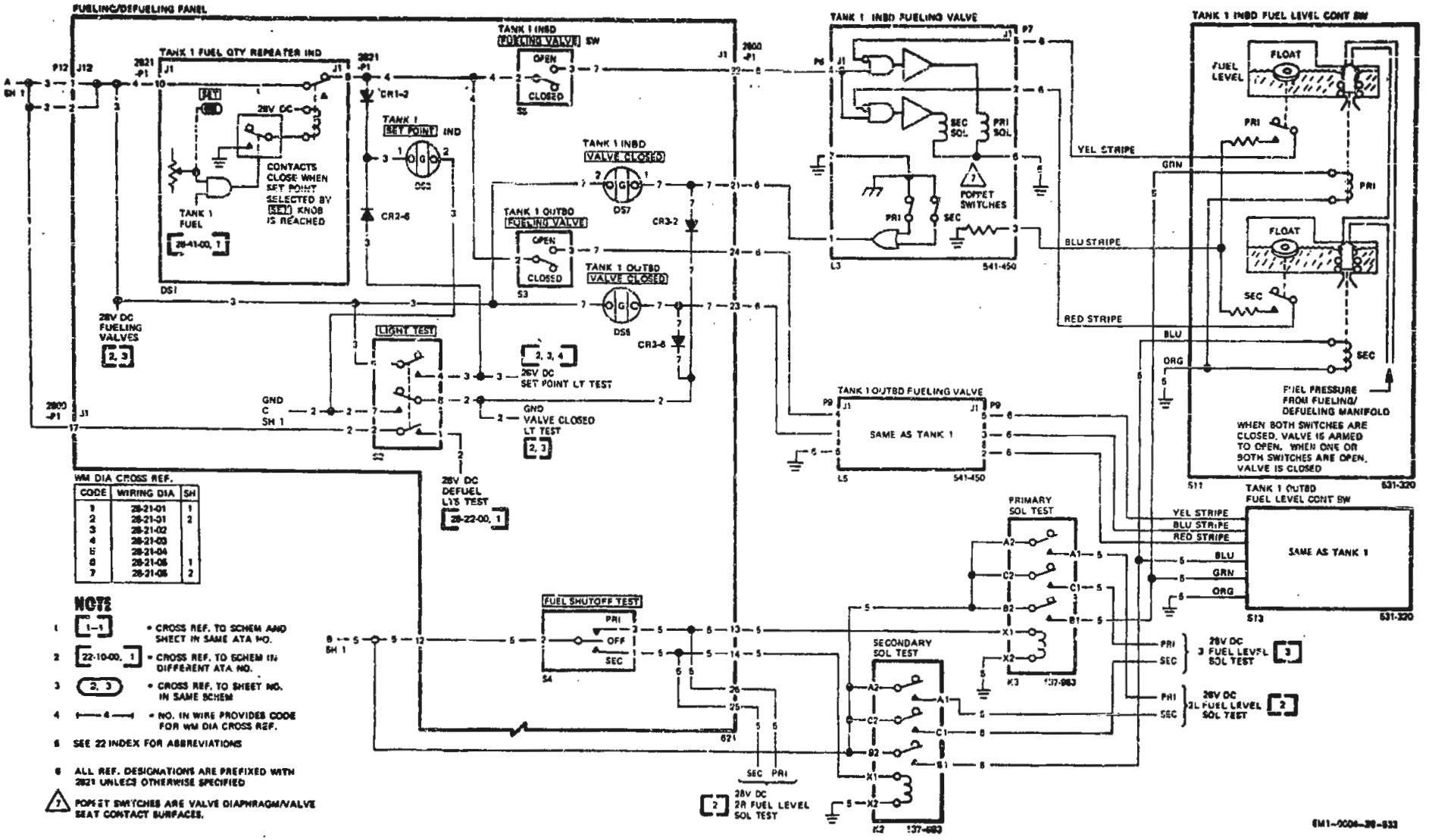
1. [1-1] = CROSS REF TO SCHEM AND SHEET IN SAME ATA NO.
2. [22 10 00, 1] = CROSS REF TO SCHEM IN DIFFERENT ATA NO.
3. (2, 3) = CROSS REF. TO SHEET NO. IN SAME SCHEM
4. —4— = NO IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.
5. SEE 22 INDEX FOR ABBREVIATIONS
6. ALL REF. DESIGNATIONS ARE PREFIXED WITH 2021 UNLESS OTHERWISE SPECIFIED

EM1-0003-28-020

Pressure Fueling System Schematic
SCHEM 1 (Sheet 1)

R EFFECTIVITY: 024, 027
R

001B

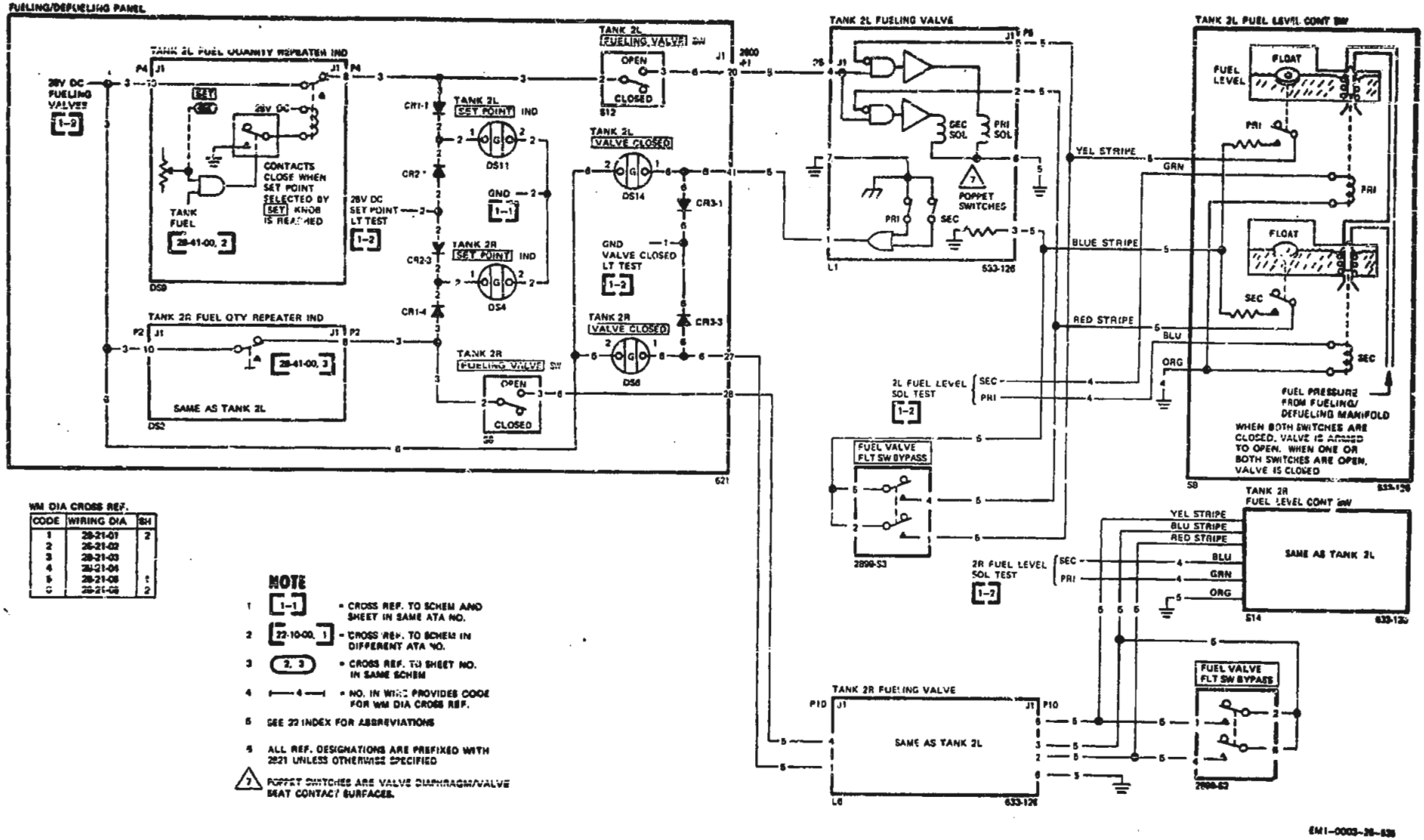

FUELING/DEFUELING PANEL
TANK 1 FUEL QTY REPEATER IND
TANK 1 INBD FUELING VALVE SW
TANK 1 SET POINT IND
TANK 1 INBD VALVE CLOSED
TANK 1 OUTBD FUELING VALVE SW
TANK 1 OUTBD VALVE CLOSED
LIGHT TEST
28V DC FUELING VALVES
28V DC SET POINT LT TEST
GND VALVE CLOSED LT TEST
28V DC DEFUEL LTS TEST
TANK 1 INBD FUELING VALVE
TANK 1 OUTBD FUELING VALVE
SAME AS TANK 1
POPPET SWITCHES
TANK 1 INBD FUEL LEVEL CONT SW
TANK 1 OUTBD FUEL LEVEL CONT SW
FUEL PRESSURE FROM FUELING/ DEFUELING MANIFOLD
WHEN BOTH SWITCHES ARE CLOSED, VALVE IS ARMED TO OPEN. WHEN ONE OR BOTH SWITCHES ARE OPEN, VALVE IS CLOSED
YEL STRIPE
BLU STRIPE
RED STRIPE
GRN
BLU
ORG
PRIMARY SOL TEST
SECONDARY SOL TEST
FUEL SHUTOFF TEST
28V DC 3 FUEL LEVEL SOL TEST
28V DC 2L FUEL LEVEL SOL TEST
28V DC 2R FUEL LEVEL SOL TEST
WM DIA CROSS REF.
NOTE
ALL REF. DESIGNATIONS ARE PREFIXED WITH 2821 UNLESS OTHERWISE SPECIFIED
POPPET SWITCHES ARE VALVE DIAPHRAGM/VALVE SEAT CONTACT SURFACES.

CODE	WIRING DIA	SH
1	28-21-01	1
2	28-21-01	2
3	28-21-02	
4	28-21-03	
5	28-21-04	
6	28-21-05	1
7	28-21-05	2

1	[1-1] • CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2	[22-10-00, 1] • CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3	(2, 3) • CROSS REF. TO SHEET NO. IN SAME SCHEM
4	1—4— • NO. IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.
5	SEE 22 INDEX FOR ABBREVIATIONS
6	ALL REF. DESIGNATIONS ARE PREFIXED WITH 2821 UNLESS OTHERWISE SPECIFIED
7	POPPET SWITCHES ARE VALVE DIAPHRAGM/VALVE SEAT CONTACT SURFACES.

R Pressure Fueling System Schematic
R SCHEM 1 (Sheet 2)

EFFECTIVITY: 001-024, 027



WM DIA CROSS REF.

CODE	WIRING DIA	SH
1	28-21-01	2
2	28-21-02	
3	28-21-03	
4	28-21-04	
5	28-21-05	1
6	28-21-06	2

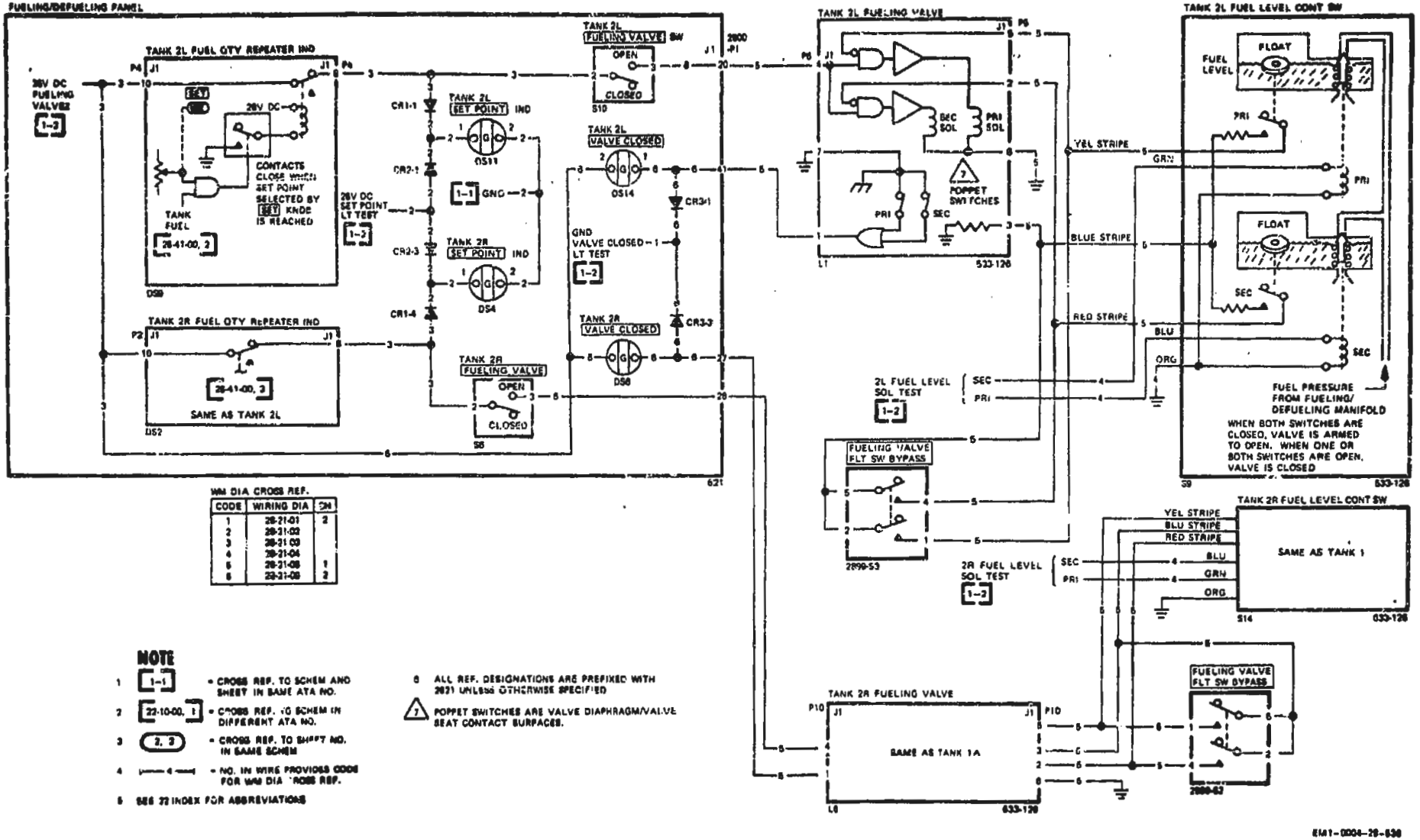
NOTE

1. [1-1] - CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2. [22-10-00, 1] - CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3. (2, 3) - CROSS REF. TO SHEET NO. IN SAME SCHEM
4. —4— - NO. IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.
5. SEE 22 INDEX FOR ABBREVIATIONS
6. ALL REF. DESIGNATIONS ARE PREFIXED WITH 2821 UNLESS OTHERWISE SPECIFIED
7. POPPET SWITCHES ARE VALVE DIAPHRAGM/VALVE SEAT CONTACT SURFACES.

EMI-0003-28-835

R Pressure Fueling System Schematic
R SCHEM 1 (Sheet 3)

EFFECTIVITY: 001-023



WM DIA CROSS REF.

CODE	WIRING DIA	GA
1	20-21-01	2
2	20-21-02	
3	20-21-03	
4	20-21-04	
5	20-21-05	1
6	20-21-06	2

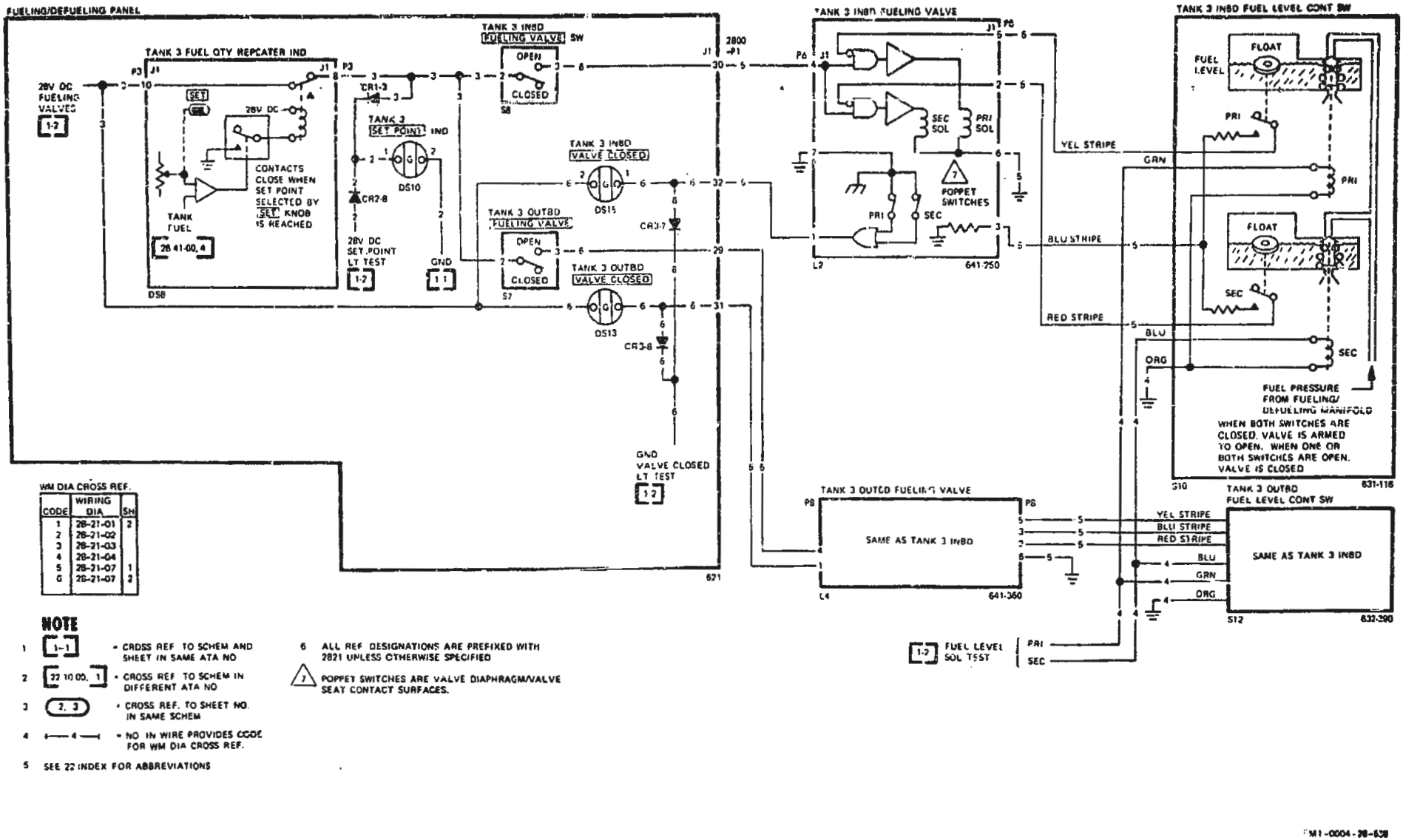
NOTE

1. 1-1 = CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2. 22-10-00, 1 = CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3. 2, 3 = CROSS REF. TO SHEET NO. IN SAME SCHEM
4. 4 = NO. IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.
5. SEE 22 INDEX FOR ABBREVIATIONS
6. ALL REF. DESIGNATIONS ARE PREFIXED WITH 2821 UNLESS OTHERWISE SPECIFIED
7. POPPET SWITCHES ARE VALVE DIAPHRAGM/VALVE SEAT CONTACT SURFACES.

EM1-0004-28-530

R Pressure Fueling System Schematic
R SCHEM 1 (Sheet 3)

EFFECTIVITY: 024,027



WM DIA CROSS REF.

CODE	WIRING DIA	SH
1	28-21-01	2
2	28-21-02	
3	28-21-03	
4	28-21-04	
5	28-21-07	1
6	28-21-07	2

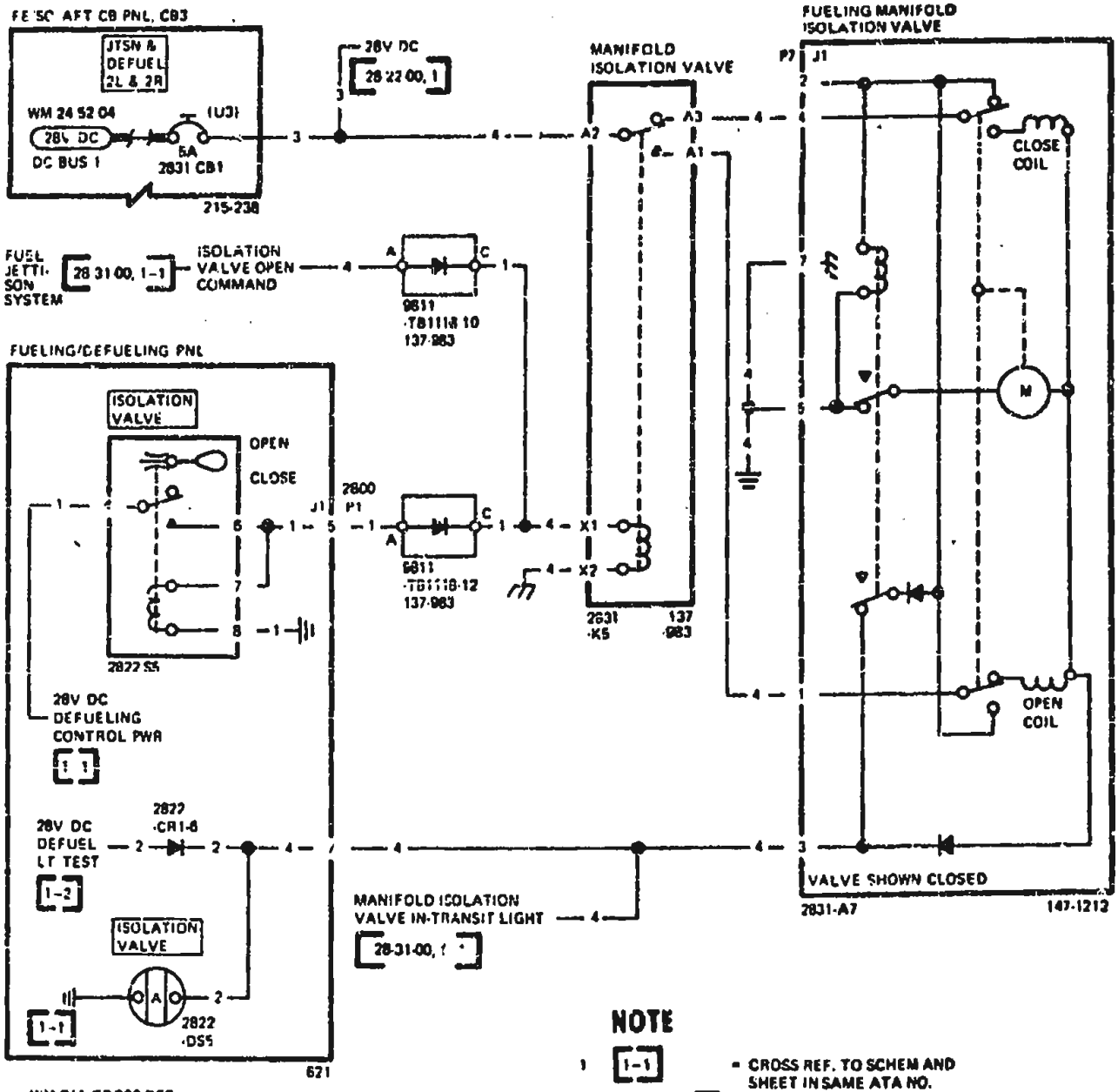
NOTE

1. [1-1] - CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2. [22 10 00, 1] - CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3. (2, 3) - CROSS REF. TO SHEET NO. IN SAME SCHEM.
4. ⟵4⟶ - NO. IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.
5. SEE 22 INDEX FOR ABBREVIATIONS.
6. ALL REF. DESIGNATIONS ARE PREFIXED WITH 2821 UNLESS OTHERWISE SPECIFIED.
7. POPPET SWITCHES ARE VALVE DIAPHRAGM/VALVE SEAT CONTACT SURFACES.

FM1-0004-28-638

R Pressure Fueling System Schematic
R SCHEM 1 (Sheet 4)

EFFECTIVITY: 001-024, 027



WM DIA CROSS REF.

CODE	WIRING DIA	SH
1	28-22-01	1
2	28-22-01	2
3	28-31-03	1
4	28-31-03	2

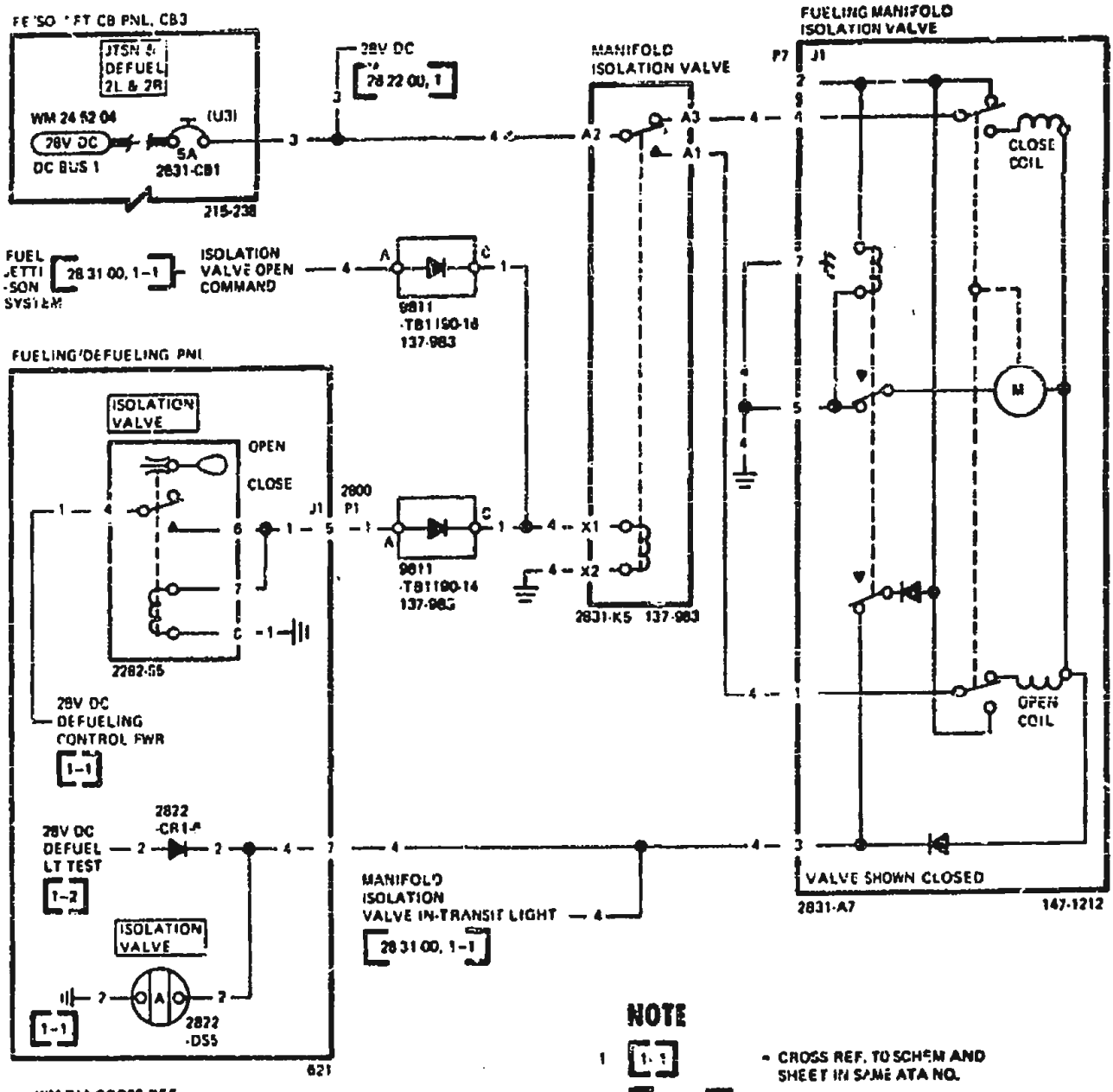
NOTE

1. [1-1] = CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2. [22-10-00, 1] = CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3. (2, 3) = CROSS REF. TO SHEET NO. IN SAME SCHEM
4. —4— = NO. IN WIRE PROVIDES CODE FOR WDM DIA CROSS REF.
5. SEE INDEX FOR ABBREVIATIONS
6. ALL REF. DESIGNATIONS ARE PREFIXED WITH 2821 UNLESS OTHERWISE SPECIFIED

EM1-0002-28-540

Fueling Manifold Isolation Valve Schematic
SCHEM 2

EFFECTIVITY: 001-023



WM DIA CROSS REF.

CODE	WIRING DIA	SH
1	28-22-01	1
2	28-22-01	2
3	28-31-03	1
4	28-31-03	2

NOTE

1. [1-1] - CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2. [22-10-00, 1] - CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3. (2, 3) - CROSS REF. TO SHEET NO. IN SAME SCHEM
4. —4— - NO. IN WIRE PROVIDES CODE FOR WDM DIA CROSS REF.
5. SEE 22 INDEX FOR ABBREVIATIONS
6. ALL REF. DESIGNATIONS ARE PREFIXED WITH 2821 UNLESS OTHERWISE SPECIFIED

EM1-0002-28-541

Fueling Manifold Isolation Valve Schematic
SCHEM 2

EFFECTIVITY: 024, 027

PRESSURE FUELING - FAULT ISOLATION

1. General

Reference data and fault isolation procedures for troubleshooting pressure fueling system faults are included in the section of the manual. A fueling system malfunction detected by the flight crew is normally entered in the aircraft flight log book and reported to maintenance personnel by a FIRM fault code number. This number and the flight log book write-up can be found in the Chapter 28 Fault Code Index. The index specifies the maintenance manual section, fault isolation diagram figure number and, where appropriate the fault isolation procedure. When no block number is specified, the diagram entry point is block 1.

Prerequisites listed at the top of each diagram identify mandatory preliminary steps and circuit breakers that must be closed before initiating any fault isolation step.

Schematic diagrams, identified by a SCHEM number, supplement fault isolation procedures as maintenance aids. The schematics show the basic system circuitry necessary for troubleshooting and include cross-reference indexes to the wiring diagram manual pages required for checking component interconnect wiring.

2. Fault Isolation

Table 101 is a list of fault isolation data is this section of the manual.

Fault Isolation Data
Table 101

	FIGURE NUMBER	TITLE
	101	Component Locator Index
	102	Component Locator
	103	Tank 1/3 Fueling Valve Does Not Open
	104	Tank 2L, 2R, 1A, or 3A Fueling Valve Does Not Open
	105	Fueling Valve Does Not Open
	106	Fueling Valve Fails to Close
	107	ISOLATION VALVE Amber Disagreement Light Problems
	108	SET POINT or VALVE CLOSED Lights Check out
R	109	Indicator Light Assembly Fault Details
	SCHEM 1	Pressure Fueling System Power Distribution Schematic
	SCHEM 2	Tank 1A Pressure Fueling System Schematic
	SCHEM 3	Tank 3A Pressure Fueling System Schematic
	SCHEM 4	Tank 2L/2R Pressure Fueling System Schematice
	SCHEM 5	Fueling Manifold Isolation Valve Schematic

COMPONENT	QTY	AREA/ACCESS	REFERENCE
ADAPTER, PRESSURE FUELING HOSE	1	WING LE, 521/621FB	28-21-01
CIRCUIT BREAKERS			
DC BUS PWR REFUEL (2821-CB8)	1	GALLEY LEFT CB PNL	*
FUEL SYS GA RPTR IND (2821-CB2)	1	GALLEY RIGHT CB PNL	*
FUEL VALVES-TEST (2821-CB4)	1	GALLEY RIGHT CB PNL	*
FUEL VALVES (2820-CB2)	1	GALLEY RIGHT CB PNL	*
REFUEL PWR WNT (2821-CB1)	1	GALLEY RIGHT CB PNL	*
REFUEL ALTN PWR (2821-CB7)	1	GALLEY RIGHT CB PNL	*
GAGE, FUEL LEVEL SIGHT			
TANK 1, 2L, 2R, 3	12	LWR WING SURFACE	28-41-24
TANK 1A, 3A	2	LWR FUSELAGE FAIRING	28-41-48
PANEL			
FUELING/DEFUELING	1	RT WING LE/621FB	28-21-99
RELAY			
REFUELING POWER (2821-K4)	1	MESC/192K, 137AZ, 132FR	*
REFUEL BUS XFR (2821-K1)	1	MESC/192K, 137AZ, 132FR	*
PRIMARY SOL TEST (2821-K3)	1	MESC/192K, 137AZ, 132FR	*
SECONDARY SOL TEST (2821-K2)	1	MESC/192K, 137AZ, 132FR	
SWITCH			
FUEL LEVEL CONTROL (2L/2R)	2	UPPER WING SURFACE, 531/631AT	28-21-07
FUEL LEVEL CONTROL (1A/3A)	2	WING CTR SECT, 141AZ	28-21-09
FUEL LEVEL CONTROL BYPASS (2L/2R)	2	WING LE, 521/621GB	*
FUEL LEVEL CONTROL BYPASS (1/3)	2	WING LE, 521/621GB	*
FUEL LEVEL CONTROL BYPASS (1A/3A)	2	WING LE, 521/621GB	*
VALVE,			
FUELING (1/3)	4	WING LE, 541/641EB	28-21-10
FUELING (2L/2R)	2	WING LE, 521/621HB	28-21-10
FUELING (1A/3A)	2	MLG WHEEL WELLS,	28-21-11
MANIFOLD ISOLATION	1	HSC, CNTR SECT BEAM 147AB	28-21-03

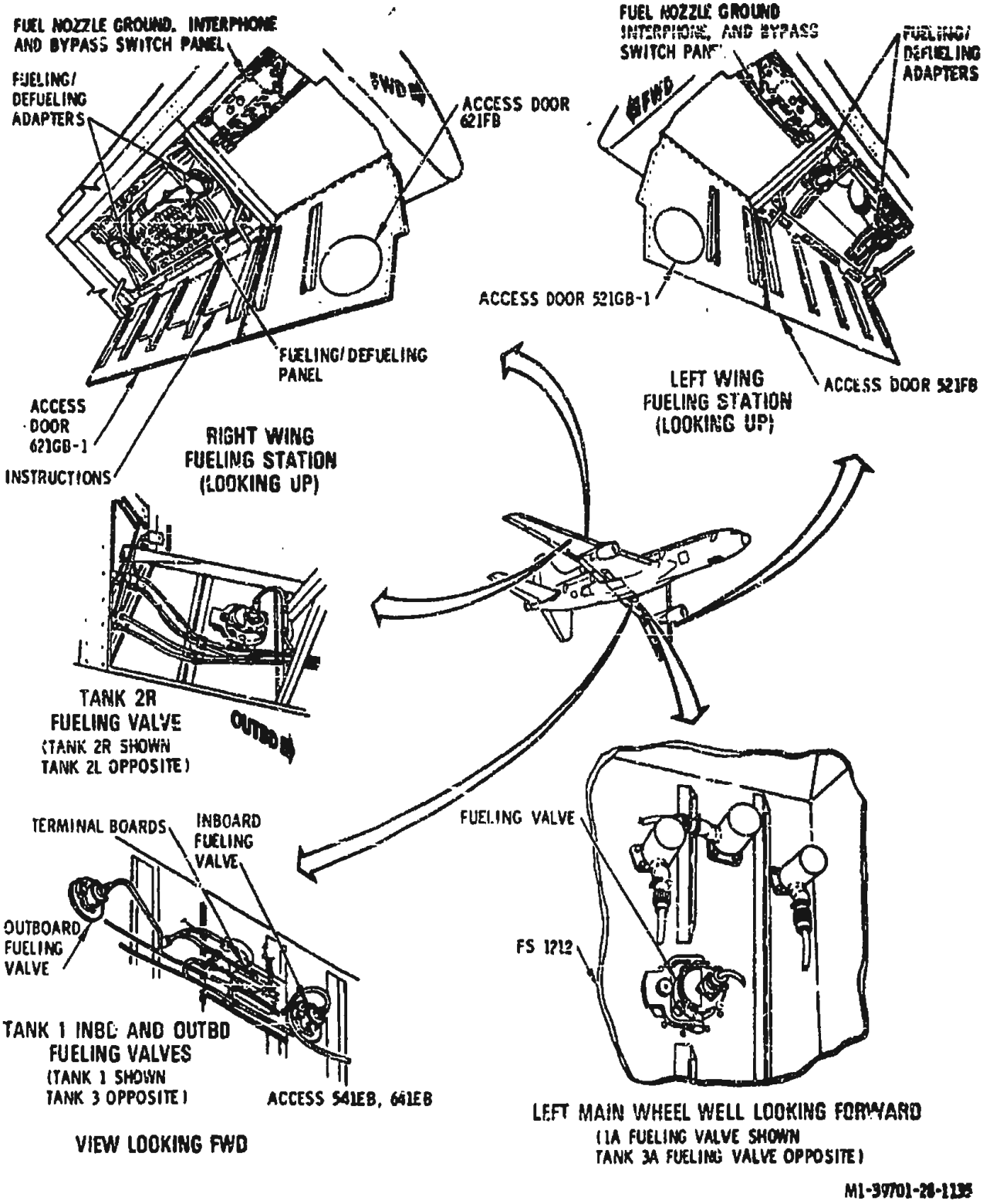
*SEE WM EQUIPMENT LIST

M1-0001-28-1515

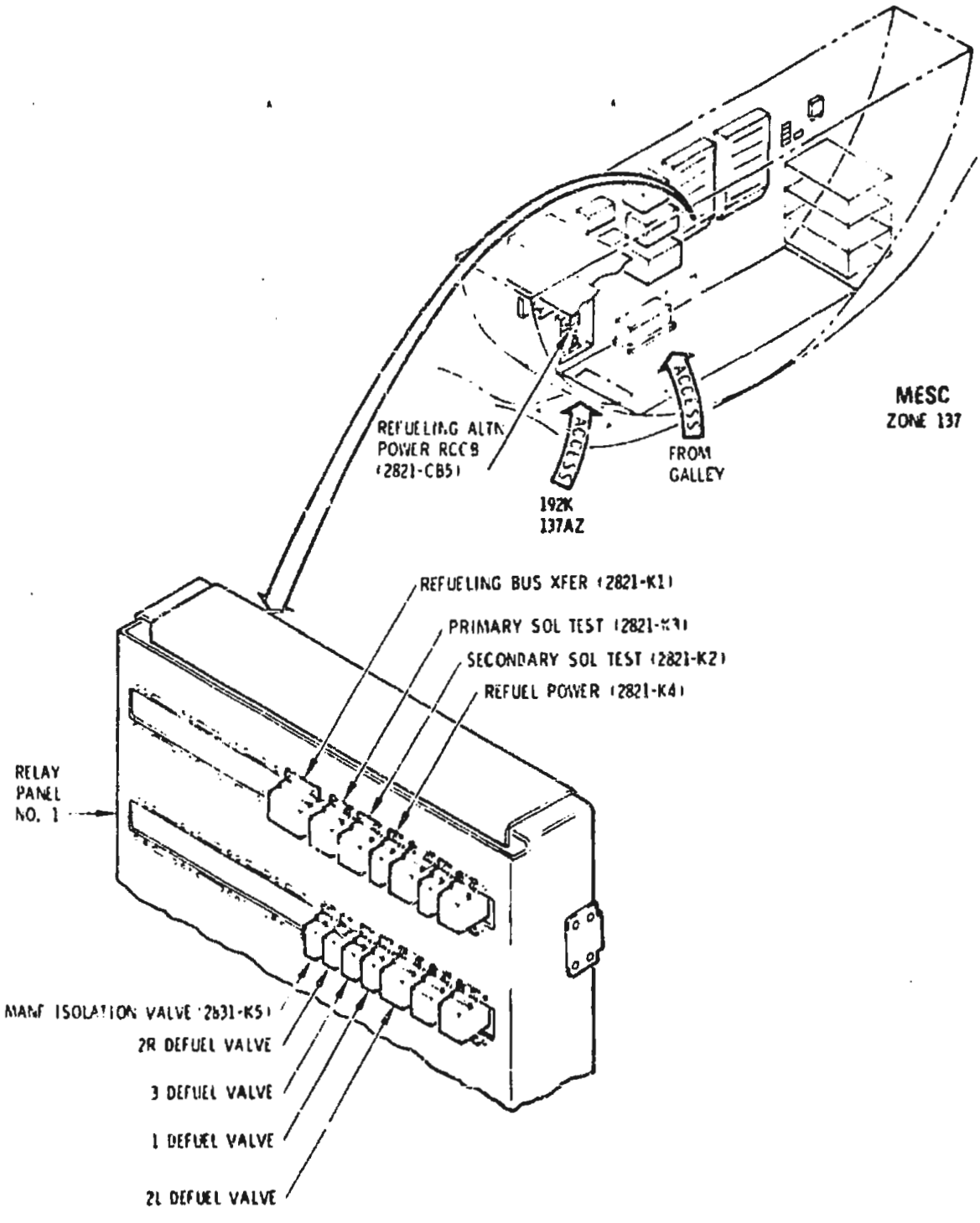
R
R

Component Locator Index
Figure 101

EFFECTIVITY: 025-026, 028-999

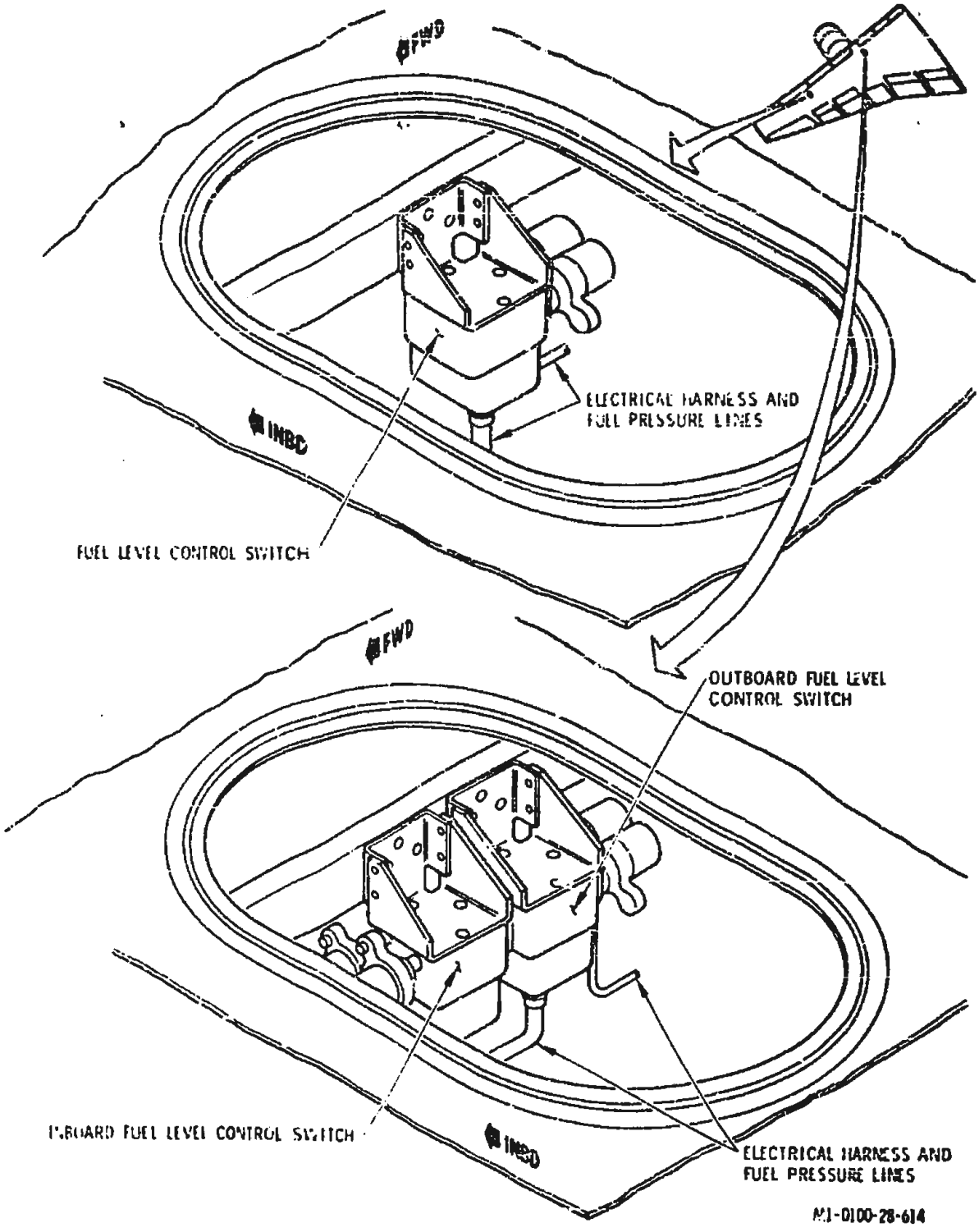


Pressure Fueling System Component Locator
Figure 102 (Sheet 1)

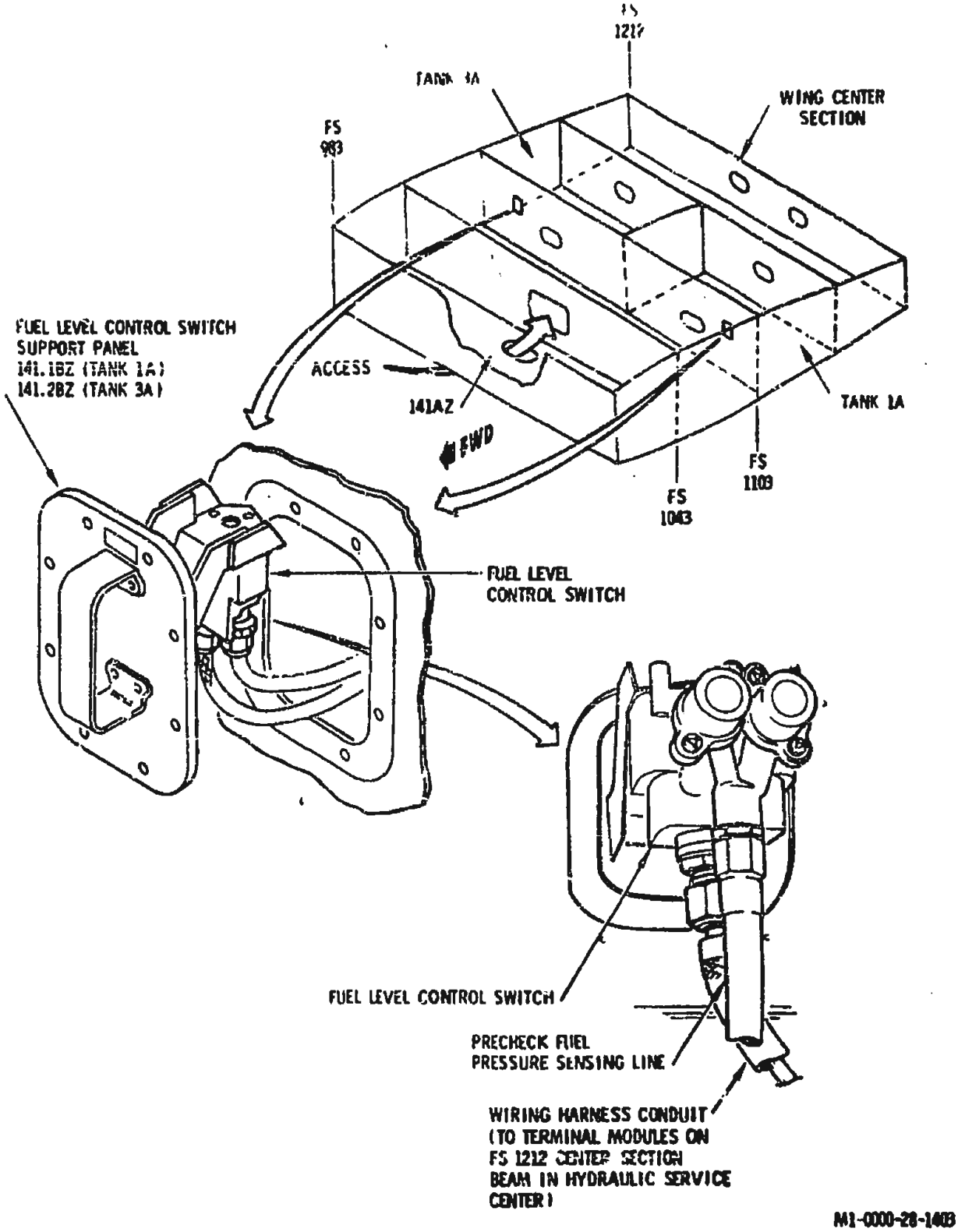


M1-0001-28-1272

Pressure Fueling System Component Locator
Figure 102 (Sheet 2)



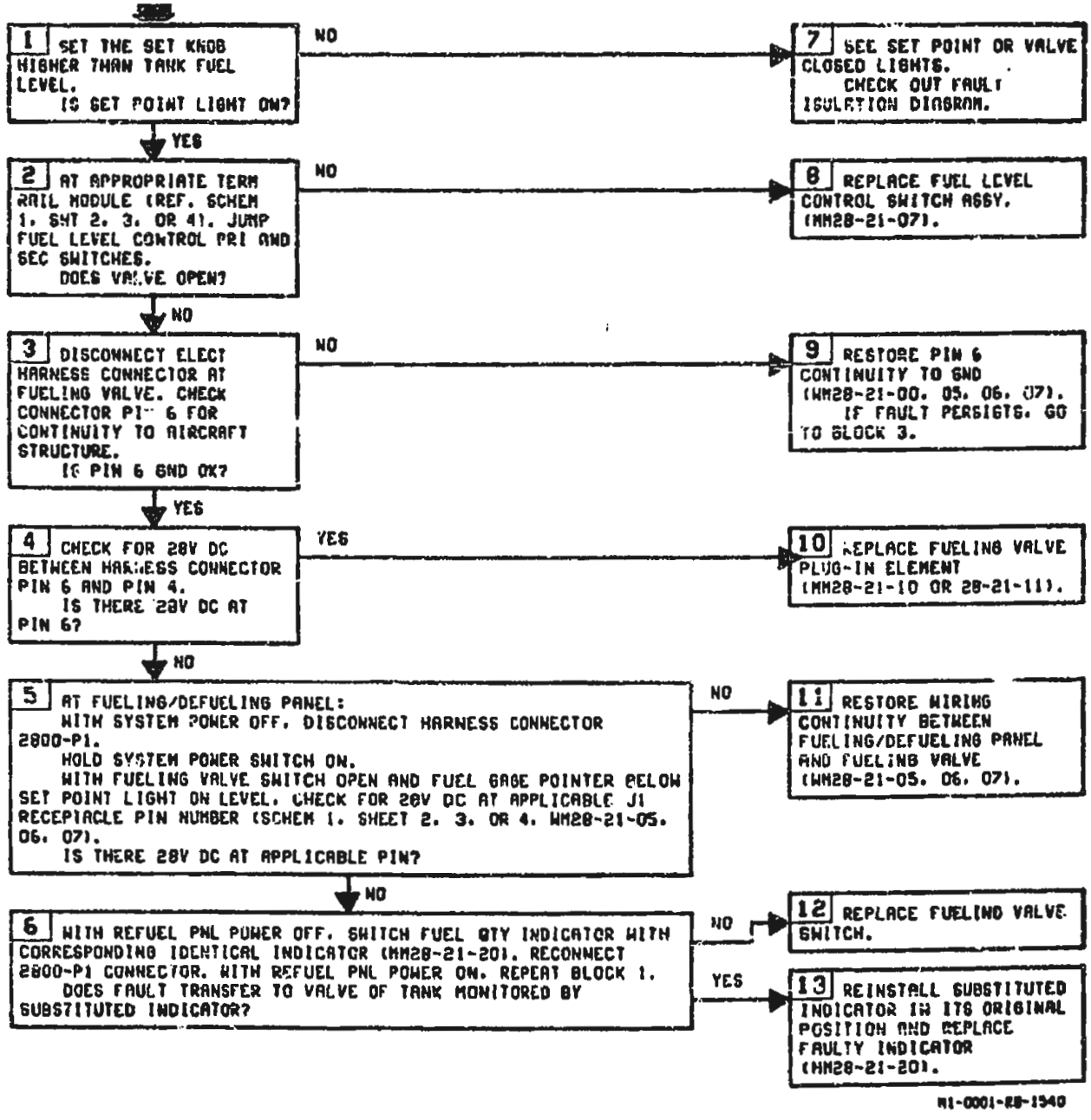
Pressure Fueling System Component Locator
Figure 102 (Sheet 3)



Pressure Fueling System Component Locator
Figure 102 (Sheet 4)

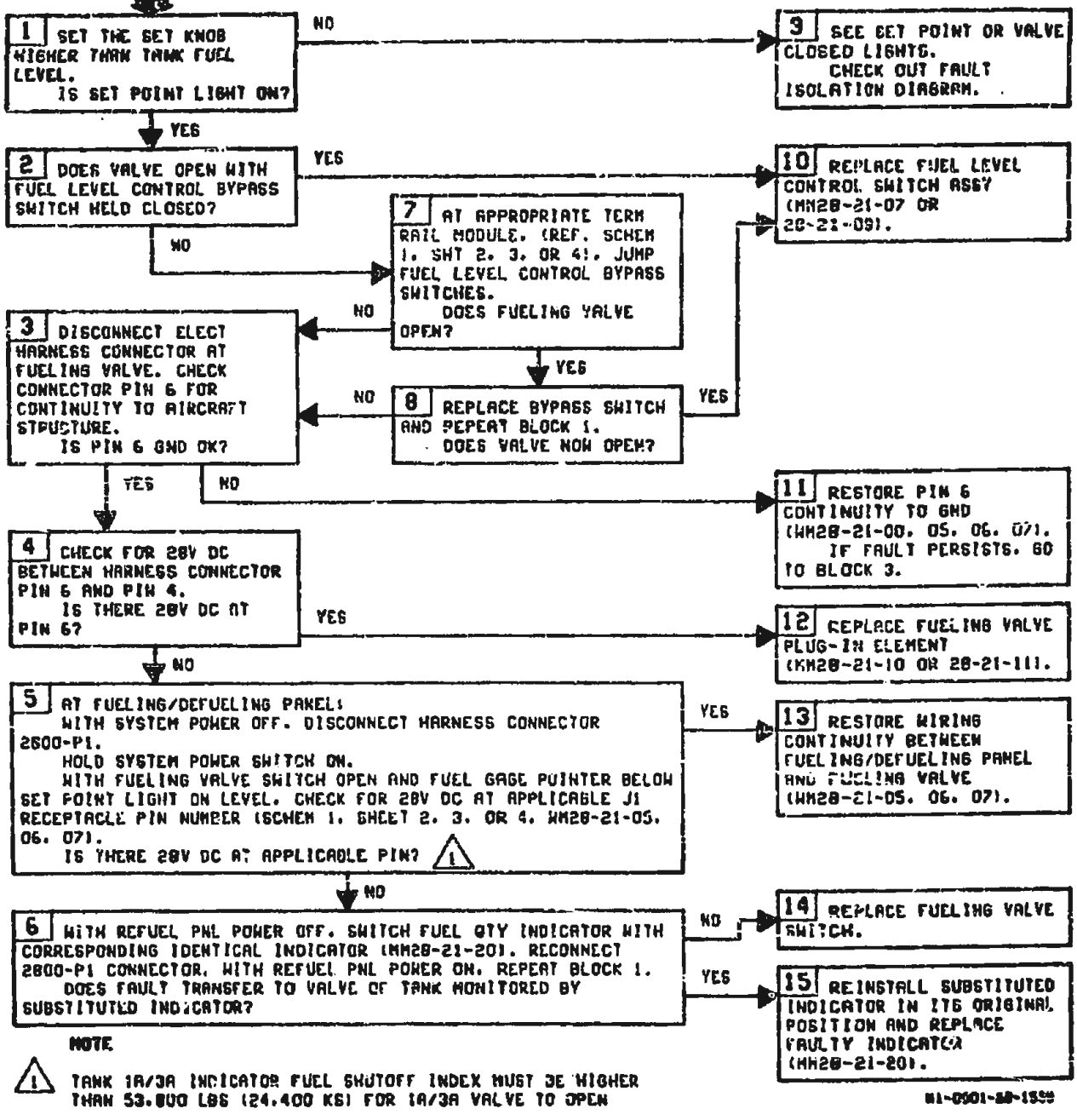
PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: GALLEY LEFT - 21B
GALLEY RIGHT - 16H, 17H, 18H
REFUELING PRESSURE APPLIED TO FUELING VALVES
REFUEL PNL SYSTEM POWER SW LATCHED ON
FUELING VALVE SELECTED OPEN
OTHER VALVES OPERATE OK

TANK 1/3 FUELING VALVE DOES NOT OPEN


1 SET THE SET KNOB HIGHER THAN TANK FUEL LEVEL.
IS SET POINT LIGHT ON?
NO
7 SEE SET POINT OR VALVE CLOSED LIGHTS.
CHECK OUT FAULT ISOLATION DIAGRAM.
YES
2 AT APPROPRIATE TERM RAIL MODULE (REF. SCHEM 1, SHT 2, 3, OR 4), JUMP FUEL LEVEL CONTROL PRI AND SEC SWITCHES.
DOES VALVE OPEN?
NO
8 REPLACE FUEL LEVEL CONTROL SWITCH ASSY. (MM28-21-07).
NO
3 DISCONNECT ELECT HARNESS CONNECTOR AT FUELING VALVE. CHECK CONNECTOR PIN 6 FOR CONTINUITY TO AIRCRAFT STRUCTURE.
IS PIN 6 GND OK?
9 RESTORE PIN 6 CONTINUITY TO GND (MM28-21-00, 05, 06, 07).
IF FAULT PERSISTS, GO TO BLOCK 3.
YES
4 CHECK FOR 28V DC BETWEEN HARNESS CONNECTOR PIN 6 AND PIN 4.
IS THERE 28V DC AT PIN 6?
YES
10 REPLACE FUELING VALVE PLUG-IN ELEMENT (MM28-21-10 OR 28-21-11).
NO
5 AT FUELING/DEFUELING PANEL:
WITH SYSTEM POWER OFF, DISCONNECT HARNESS CONNECTOR 2800-P1.
HOLD SYSTEM POWER SWITCH ON.
WITH FUELING VALVE SWITCH OPEN AND FUEL GAGE POINTER BELOW SET POINT LIGHT ON LEVEL, CHECK FOR 28V DC AT APPLICABLE J1 RECEPTACLE PIN NUMBER (SCHEM 1, SHEET 2, 3, OR 4, MM28-21-05, 06, 07).
IS THERE 28V DC AT APPLICABLE PIN?
NO
11 RESTORE WIRING CONTINUITY BETWEEN FUELING/DEFUELING PANEL AND FUELING VALVE (MM28-21-05, 06, 07).
NO
6 WITH REFUEL PNL POWER OFF, SWITCH FUEL QTY INDICATOR WITH CORRESPONDING IDENTICAL INDICATOR (MM28-21-20). RECONNECT 2800-P1 CONNECTOR. WITH REFUEL PNL POWER ON, REPEAT BLOCK 1.
DOES FAULT TRANSFER TO VALVE OF TANK MONITORED BY SUBSTITUTED INDICATOR?
12 REPLACE FUELING VALVE SWITCH.
YES
13 REINSTALL SUBSTITUTED INDICATOR IN ITS ORIGINAL POSITION AND REPLACE FAULTY INDICATOR (MM28-21-20).

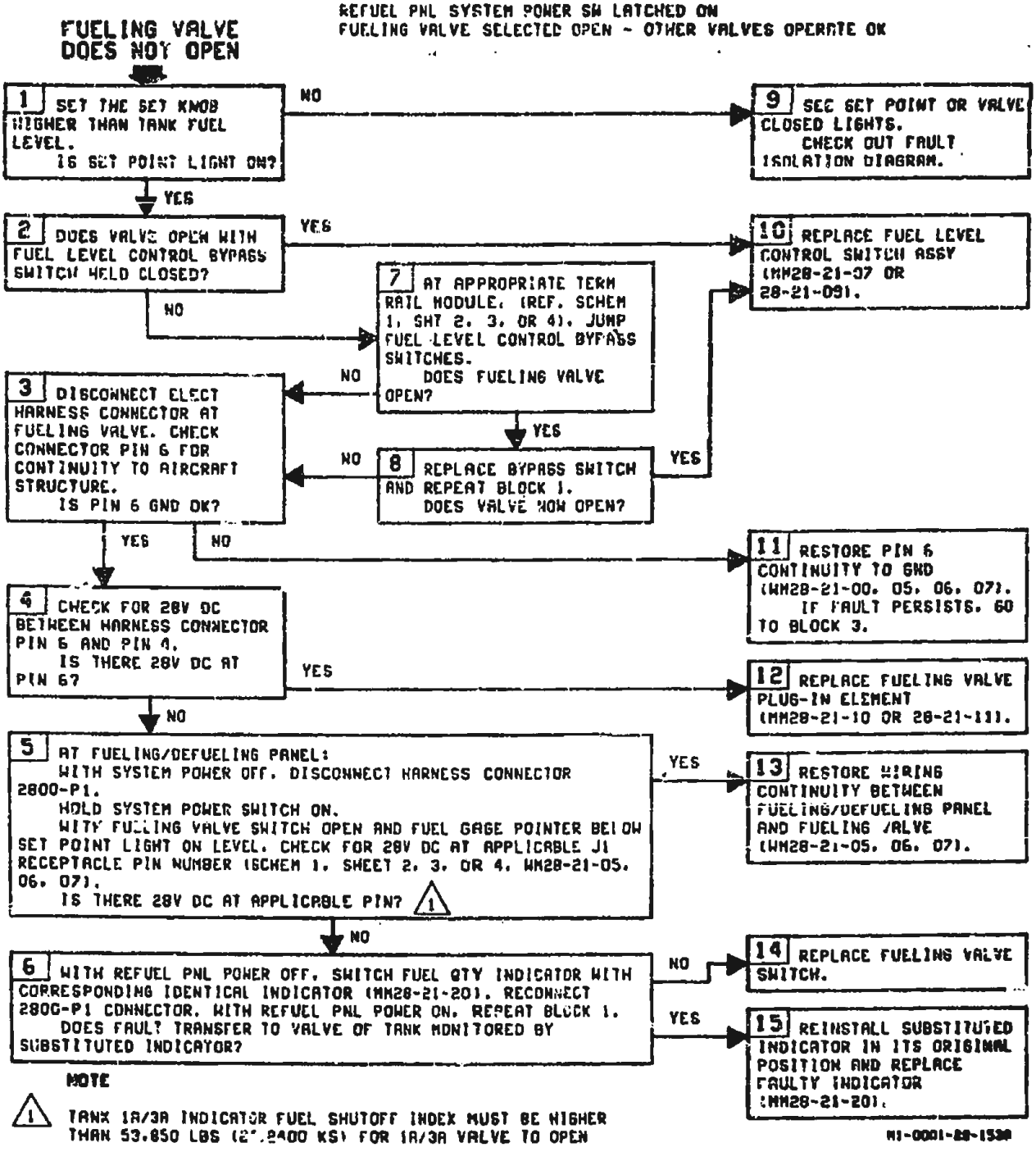
M1-0001-28-1340

R Tank 1/3 Fueling Valve Does Not Open
R Figure 103

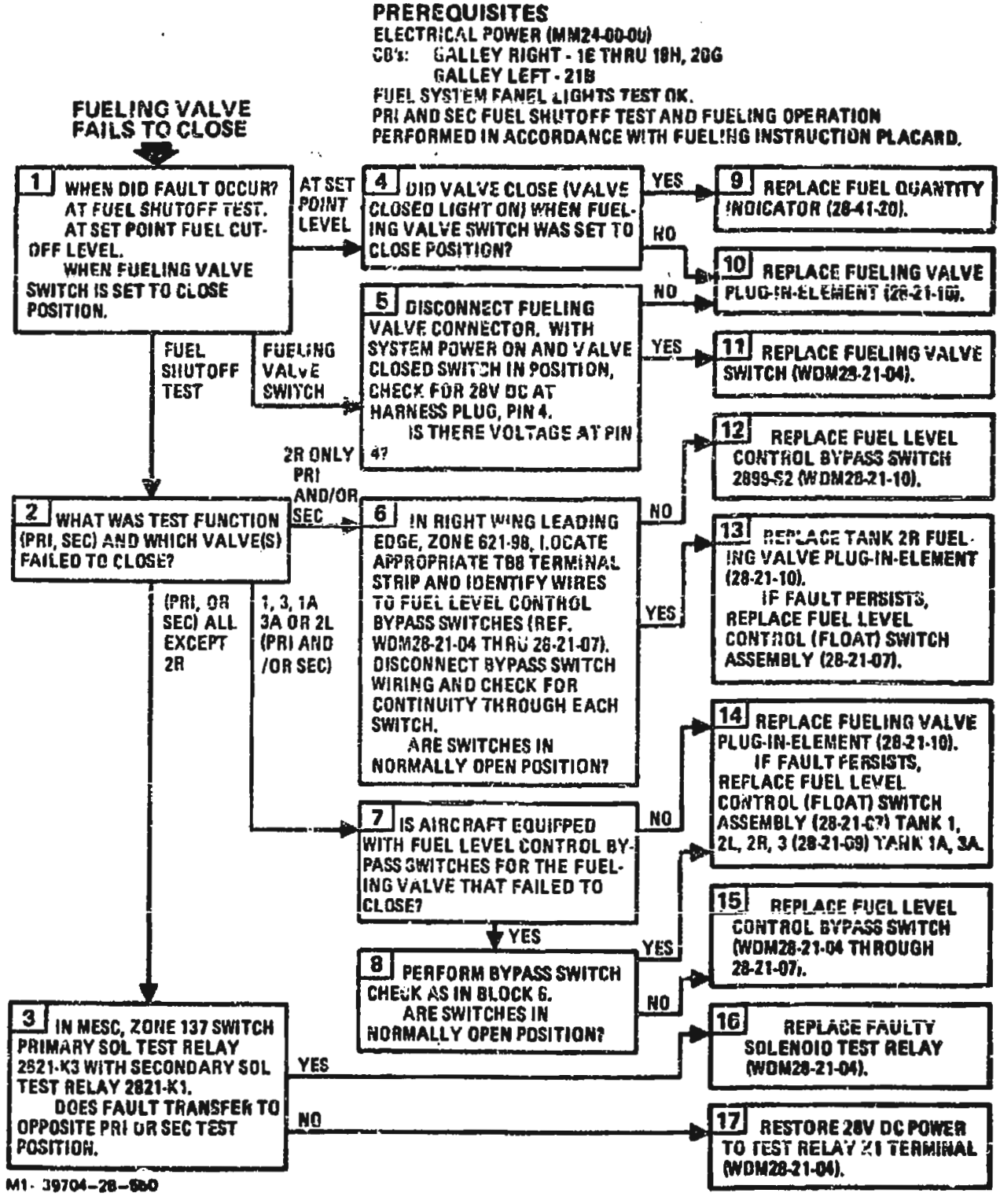

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: GALLEY LEFT - 21B
GALLEY RIGHT - 16H, 17H, 18H
REFUELING PRESSURE APPLIED TO FUELING VALVES
REFUEL PNL SYSTEM POWER SW LATCHED ON
FUELING VALVE SELECTED OPEN
OTHER VALVES OPERATE OK
TANK 2L, 2R, 1A, OR 3A FUELING VALVE DOES NOT OPEN
1 SET THE SET KNOB HIGHER THAN TANK FUEL LEVEL. IS SET POINT LIGHT ON?
NO
9 SEE SET POINT OR VALVE CLOSED LIGHTS. CHECK OUT FAULT ISOLATION DIAGRAM.
YES
2 DOES VALVE OPEN WITH FUEL LEVEL CONTROL BYPASS SWITCH HELD CLOSED?
YES
10 REPLACE FUEL LEVEL CONTROL SWITCH ASSY (MM28-21-07 OR 28-21-09).
NO
7 AT APPROPRIATE TERM RAIL MODULE, (REF. SCHEM 1, SHT 2, 3, OR 4), JUMP FUEL LEVEL CONTROL BYPASS SWITCHES. DOES FUELING VALVE OPEN?
NO
3 DISCONNECT ELECT HARNESS CONNECTOR AT FUELING VALVE. CHECK CONNECTOR PIN 6 FOR CONTINUITY TO AIRCRAFT STRUCTURE. IS PIN 6 GND OK?
YES
8 REPLACE BYPASS SWITCH AND REPEAT BLOCK 1. DOES VALVE NOW OPEN?
YES
NO
YES
NO
11 RESTORE PIN 6 CONTINUITY TO GND (MM28-21-00, 05, 06, 07). IF FAULT PERSISTS, GO TO BLOCK 3.
4 CHECK FOR 28V DC BETWEEN HARNESS CONNECTOR PIN 6 AND PIN 4. IS THERE 28V DC AT PIN 6?
YES
12 REPLACE FUELING VALVE PLUG-IN ELEMENT (MM28-21-10 OR 28-21-11).
NO
5 AT FUELING/DEFUELING PANEL: WITH SYSTEM POWER OFF, DISCONNECT HARNESS CONNECTOR 2600-P1. HOLD SYSTEM POWER SWITCH ON. WITH FUELING VALVE SWITCH OPEN AND FUEL GAGE POINTER BELOW SET POINT LIGHT ON LEVEL, CHECK FOR 28V DC AT APPLICABLE J1 RECEPTACLE PIN NUMBER (SCHEM 1, SHEET 2, 3, OR 4, MM28-21-05, 06, 07). IS THERE 28V DC AT APPLICABLE PIN? 1
YES
13 RESTORE WIRING CONTINUITY BETWEEN FUELING/DEFUELING PANEL AND FUELING VALVE (MM28-21-05, 06, 07).
NO
6 WITH REFUEL PNL POWER OFF, SWITCH FUEL QTY INDICATOR WITH CORRESPONDING IDENTICAL INDICATOR (MM28-21-20). RECONNECT 2600-P1 CONNECTOR. WITH REFUEL PNL POWER ON, REPEAT BLOCK 1. DOES FAULT TRANSFER TO VALVE OF TANK MONITORED BY SUBSTITUTED INDICATOR?
NO
14 REPLACE FUELING VALVE SWITCH.
YES
15 REINSTALL SUBSTITUTED INDICATOR IN ITS ORIGINAL POSITION AND REPLACE FAULTY INDICATOR (MM28-21-20).
NOTE
1 TANK 1A/3A INDICATOR FUEL SHUTOFF INDEX MUST BE HIGHER THAN 53,000 LBS (24,400 KG) FOR 1A/3A VALVE TO OPEN
B1-0501-80-1599

R Tank 2L, 2R, 1A, or 3A Fueling Valve Does Not Open
R Figure 104

PREREQUISITES
ELECTRICAL POWER (MM24-00-001)
CB'S: GALLEY LEFT - 21B
GALLEY RIGHT - 16H, 17H, 18H
REFUELING PRESSURE APPLIED TO FUELING VALVES
REFUEL PNL SYSTEM POWER SW LATCHED ON
FUELING VALVE SELECTED OPEN - OTHER VALVES OPERATE OK

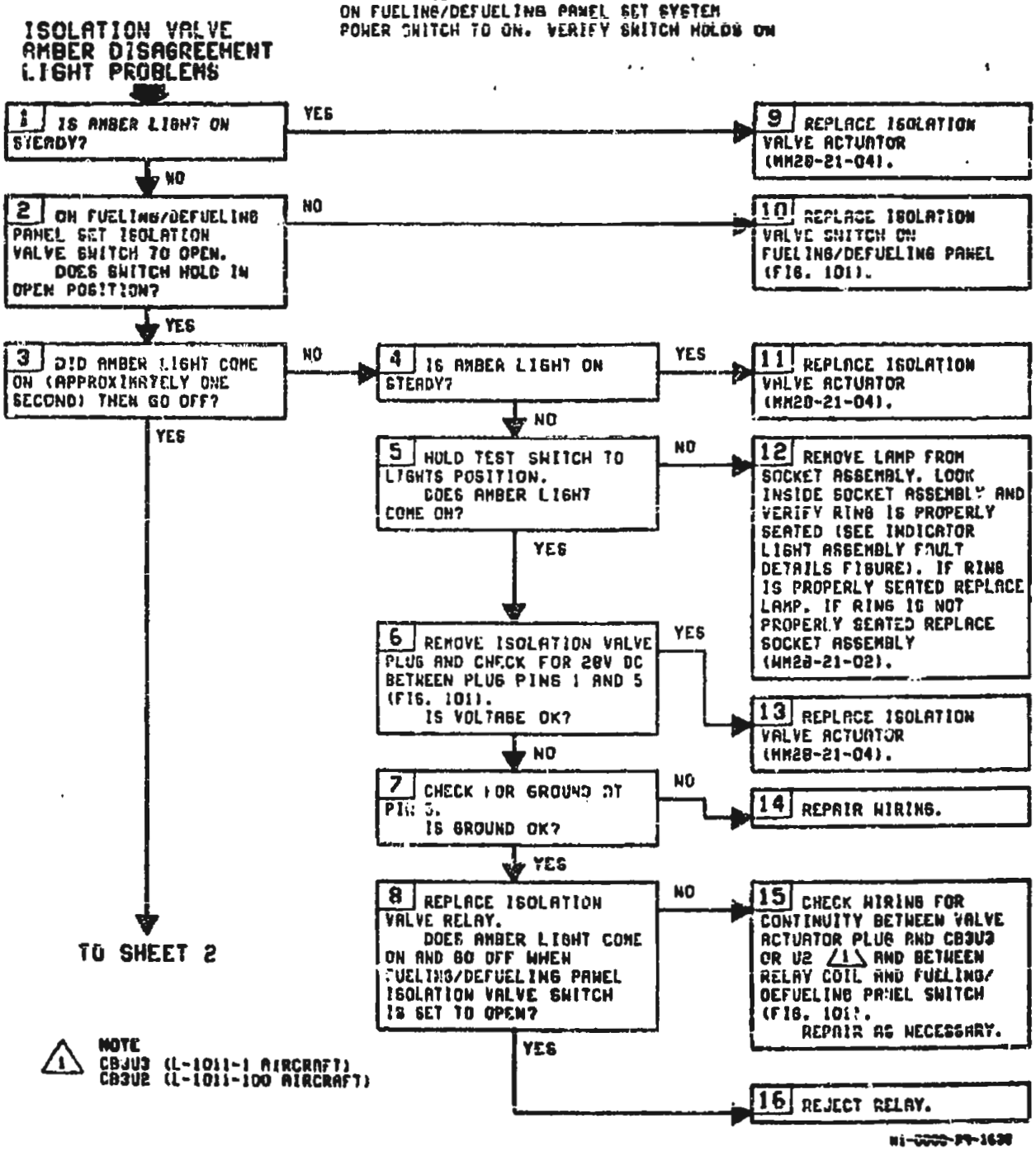

FUELING VALVE DOES NOT OPEN
1 SET THE SET KNOB HIGHER THAN TANK FUEL LEVEL. IS SET POINT LIGHT ON?
NO
9 SEE SET POINT OR VALVE CLOSED LIGHTS. CHECK OUT FAULT ISOLATION DIAGRAM.
YES
2 DOES VALVE OPEN WITH FUEL LEVEL CONTROL BYPASS SWITCH HELD CLOSED?
YES
10 REPLACE FUEL LEVEL CONTROL SWITCH ASSY (MM28-21-07 OR 28-21-091.
NO
7 AT APPROPRIATE TERM RAIL MODULE, (REF. SCHEM 1, SHT 2, 3, OR 4), JUMP FUEL LEVEL CONTROL BYPASS SWITCHES. DOES FUELING VALVE OPEN?
NO
3 DISCONNECT ELECT HARNESS CONNECTOR AT FUELING VALVE. CHECK CONNECTOR PIN 6 FOR CONTINUITY TO AIRCRAFT STRUCTURE. IS PIN 6 GND OK?
YES
8 REPLACE BYPASS SWITCH AND REPEAT BLOCK 1. DOES VALVE NOW OPEN?
YES
NO
YES
NO
11 RESTORE PIN 6 CONTINUITY TO GND (MM28-21-00, 05, 06, 07). IF FAULT PERSISTS, GO TO BLOCK 3.
4 CHECK FOR 28V DC BETWEEN HARNESS CONNECTOR PIN 6 AND PIN 4. IS THERE 28V DC AT PIN 6?
YES
12 REPLACE FUELING VALVE PLUG-IN ELEMENT (MM28-21-10 OR 28-21-11).
NO
5 AT FUELING/DEFUELING PANEL: WITH SYSTEM POWER OFF, DISCONNECT HARNESS CONNECTOR 2800-P1. HOLD SYSTEM POWER SWITCH ON. WITH FUELING VALVE SWITCH OPEN AND FUEL GAGE POINTER BELOW SET POINT LIGHT ON LEVEL, CHECK FOR 28V DC AT APPLICABLE J1 RECEPTACLE PIN NUMBER (SCHEM 1, SHEET 2, 3, OR 4, MM28-21-05, 06, 07). IS THERE 28V DC AT APPLICABLE PIN? 1
YES
13 RESTORE WIRING CONTINUITY BETWEEN FUELING/DEFUELING PANEL AND FUELING VALVE (MM28-21-05, 06, 07).
NO
6 WITH REFUEL PNL POWER OFF, SWITCH FUEL QTY INDICATOR WITH CORRESPONDING IDENTICAL INDICATOR (MM28-21-20). RECONNECT 2800-P1 CONNECTOR. WITH REFUEL PNL POWER ON, REPEAT BLOCK 1. DOES FAULT TRANSFER TO VALVE OF TANK MONITORED BY SUBSTITUTED INDICATOR?
NO
14 REPLACE FUELING VALVE SWITCH.
YES
15 REINSTALL SUBSTITUTED INDICATOR IN ITS ORIGINAL POSITION AND REPLACE FAULTY INDICATOR (MM28-21-20).
NOTE
1 TANK 1A/3A INDICATOR FUEL SHUTOFF INDEX MUST BE HIGHER THAN 53,850 LBS (24,2400 KS) FOR 1A/3A VALVE TO OPEN
M1-0001-28-1530

R Fueling Valve Does Not Open
R Figure 105


PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB's: GALLEY RIGHT - 1E THRU 18H, 20G
GALLEY LEFT - 21B
FUEL SYSTEM PANEL LIGHTS TEST OK.
PRI AND SEC FUEL SHUTOFF TEST AND FUELING OPERATION PERFORMED IN ACCORDANCE WITH FUELING INSTRUCTION PLACARD.
FUELING VALVE FAILS TO CLOSE
1 WHEN DID FAULT OCCUR? AT FUEL SHUTOFF TEST. AT SET POINT FUEL CUT-OFF LEVEL. WHEN FUELING VALVE SWITCH IS SET TO CLOSE POSITION.
AT SET POINT LEVEL
FUEL SHUTOFF TEST
FUELING VALVE SWITCH
2 WHAT WAS TEST FUNCTION (PRI, SEC) AND WHICH VALVE(S) FAILED TO CLOSE?
(PRI, OR SEC) ALL EXCEPT 2R
1, 3, 1A 3A OR 2L (PRI AND /OR SEC)
2R ONLY PRI AND/OR SEC
3 IN MESC, ZONE 137 SWITCH PRIMARY SOL TEST RELAY 2821-K3 WITH SECONDARY SOL TEST RELAY 2821-K1. DOES FAULT TRANSFER TO OPPOSITE PRI OR SEC TEST POSITION.
4 DID VALVE CLOSE (VALVE CLOSED LIGHT ON) WHEN FUELING VALVE SWITCH WAS SET TO CLOSE POSITION?
5 DISCONNECT FUELING VALVE CONNECTOR. WITH SYSTEM POWER ON AND VALVE CLOSED SWITCH IN POSITION, CHECK FOR 28V DC AT HARNESS PLUG, PIN 4. IS THERE VOLTAGE AT PIN 4?
6 IN RIGHT WING LEADING EDGE, ZONE 621-98, LOCATE APPROPRIATE TB8 TERMINAL STRIP AND IDENTIFY WIRES TO FUEL LEVEL CONTROL BYPASS SWITCHES (REF. WDM28-21-04 THRU 28-21-07). DISCONNECT BYPASS SWITCH WIRING AND CHECK FOR CONTINUITY THROUGH EACH SWITCH. ARE SWITCHES IN NORMALLY OPEN POSITION?
7 IS AIRCRAFT EQUIPPED WITH FUEL LEVEL CONTROL BYPASS SWITCHES FOR THE FUELING VALVE THAT FAILED TO CLOSE?
8 PERFORM BYPASS SWITCH CHECK AS IN BLOCK 6. ARE SWITCHES IN NORMALLY OPEN POSITION?
YES
NO
9 REPLACE FUEL QUANTITY INDICATOR (28-41-20).
10 REPLACE FUELING VALVE PLUG-IN-ELEMENT (28-21-10).
11 REPLACE FUELING VALVE SWITCH (WDM28-21-04).
12 REPLACE FUEL LEVEL CONTROL BYPASS SWITCH 2899-S2 (WDM28-21-10).
13 REPLACE TANK 2R FUELING VALVE PLUG-IN-ELEMENT (28-21-10). IF FAULT PERSISTS, REPLACE FUEL LEVEL CONTROL (FLOAT) SWITCH ASSEMBLY (28-21-07).
14 REPLACE FUELING VALVE PLUG-IN-ELEMENT (28-21-10). IF FAULT PERSISTS, REPLACE FUEL LEVEL CONTROL (FLOAT) SWITCH ASSEMBLY (28-21-07) TANK 1, 2L, 2R, 3 (28-21-09) TANK 1A, 3A.
15 REPLACE FUEL LEVEL CONTROL BYPASS SWITCH (WDM28-21-04 THROUGH 28-21-07).
16 REPLACE FAULTY SOLENOID TEST RELAY (WDM28-21-04).
17 RESTORE 28V DC POWER TO TEST RELAY K1 TERMINAL (WDM28-21-04).
M1-39704-28-880

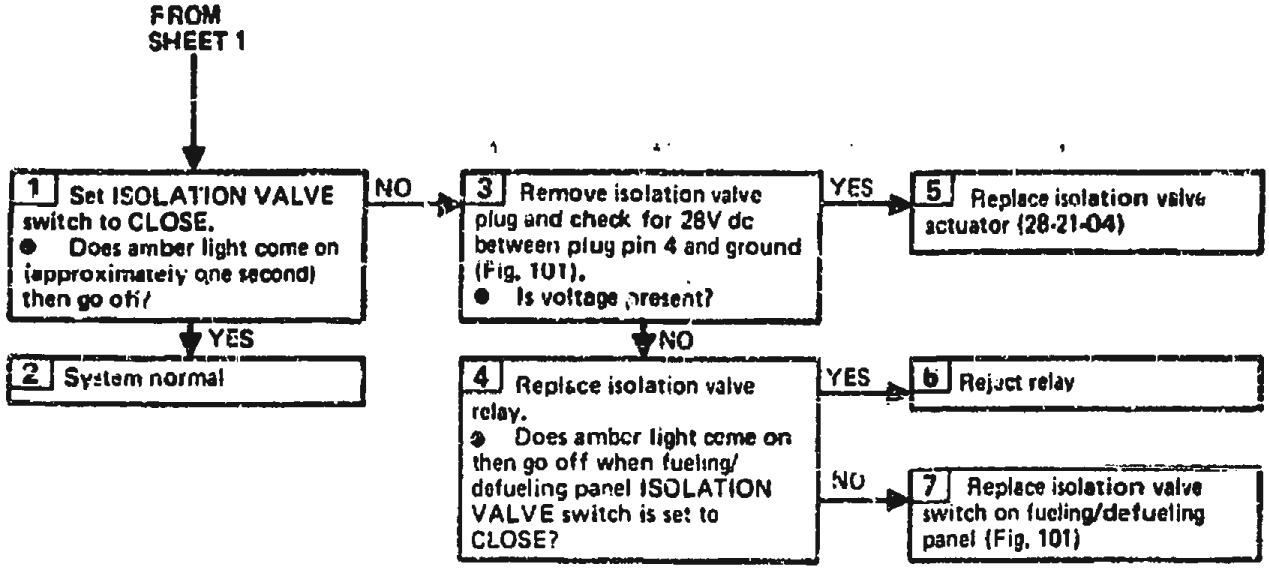
Fueling Value Fails to Close
Figure 106

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S IN: GALLEY RIGHT- H16 THRU H19, G20
GALLEY LEFT- D21
CB3-U2
ON FUELING/DEFUELING PANEL SET SYSTEM POWER SWITCH TO ON. VERIFY SWITCH HOLDS ON


ISOLATION VALVE AMBER DISAGREEMENT LIGHT PROBLEMS
1 IS AMBER LIGHT ON STEADY?
YES
9 REPLACE ISOLATION VALVE ACTUATOR (MM28-21-04).
NO
2 ON FUELING/DEFUELING PANEL SET ISOLATION VALVE SWITCH TO OPEN. DOES SWITCH HOLD IN OPEN POSITION?
NO
10 REPLACE ISOLATION VALVE SWITCH ON FUELING/DEFUELING PANEL (FIG. 101).
YES
3 DID AMBER LIGHT COME ON (APPROXIMATELY ONE SECOND) THEN GO OFF?
NO
4 IS AMBER LIGHT ON STEADY?
YES
11 REPLACE ISOLATION VALVE ACTUATOR (MM28-21-04).
NO
5 HOLD TEST SWITCH TO LIGHTS POSITION. DOES AMBER LIGHT COME ON?
NO
12 REMOVE LAMP FROM SOCKET ASSEMBLY. LOOK INSIDE SOCKET ASSEMBLY AND VERIFY RING IS PROPERLY SEATED (SEE INDICATOR LIGHT ASSEMBLY FAULT DETAILS FIGURE). IF RING IS PROPERLY SEATED REPLACE LAMP. IF RING IS NOT PROPERLY SEATED REPLACE SOCKET ASSEMBLY (MM28-21-02).
YES
6 REMOVE ISOLATION VALVE PLUG AND CHECK FOR 28V DC BETWEEN PLUG PINS 1 AND 5 (FIG. 101). IS VOLTAGE OK?
YES
13 REPLACE ISOLATION VALVE ACTUATOR (MM28-21-04).
NO
7 CHECK FOR GROUND AT PIN 5. IS GROUND OK?
NO
14 REPAIR WIRING.
YES
8 REPLACE ISOLATION VALVE RELAY. DOES AMBER LIGHT COME ON AND GO OFF WHEN FUELING/DEFUELING PANEL ISOLATION VALVE SWITCH IS SET TO OPEN?
NO
15 CHECK WIRING FOR CONTINUITY BETWEEN VALVE ACTUATOR PLUG AND CB3U3 OR U2 (1) AND BETWEEN RELAY COIL AND FUELING/ DEFUELING PANEL SWITCH (FIG. 101). REPAIR AS NECESSARY.
YES
16 REJECT RELAY.
TO SHEET 2
(1) NOTE
CB3U3 (L-1011-1 AIRCRAFT)
CB3U2 (L-1011-100 AIRCRAFT)

R ISOLATION VALVE Amber Disagreement Light Problems
R Figure 107 (Sheet 1)

EFFECTIVITY: 025-026, 028-999


FROM SHEET 1
1 Set ISOLATION VALVE switch to CLOSE.
● Does amber light come on (approximately one second) then go off?
NO
3 Remove isolation valve plug and check for 28V dc between plug pin 4 and ground (Fig. 101).
● Is voltage present?
YES
5 Replace isolation valve actuator (28-21-04)
YES
2 System normal
NO
4 Replace isolation valve relay.
● Does amber light come on then go off when fueling/defueling panel ISOLATION VALVE switch is set to CLOSE?
YES
6 Reject relay
NO
7 Replace isolation valve switch on fueling/defueling panel (Fig. 101)

M1-0000-28-1618

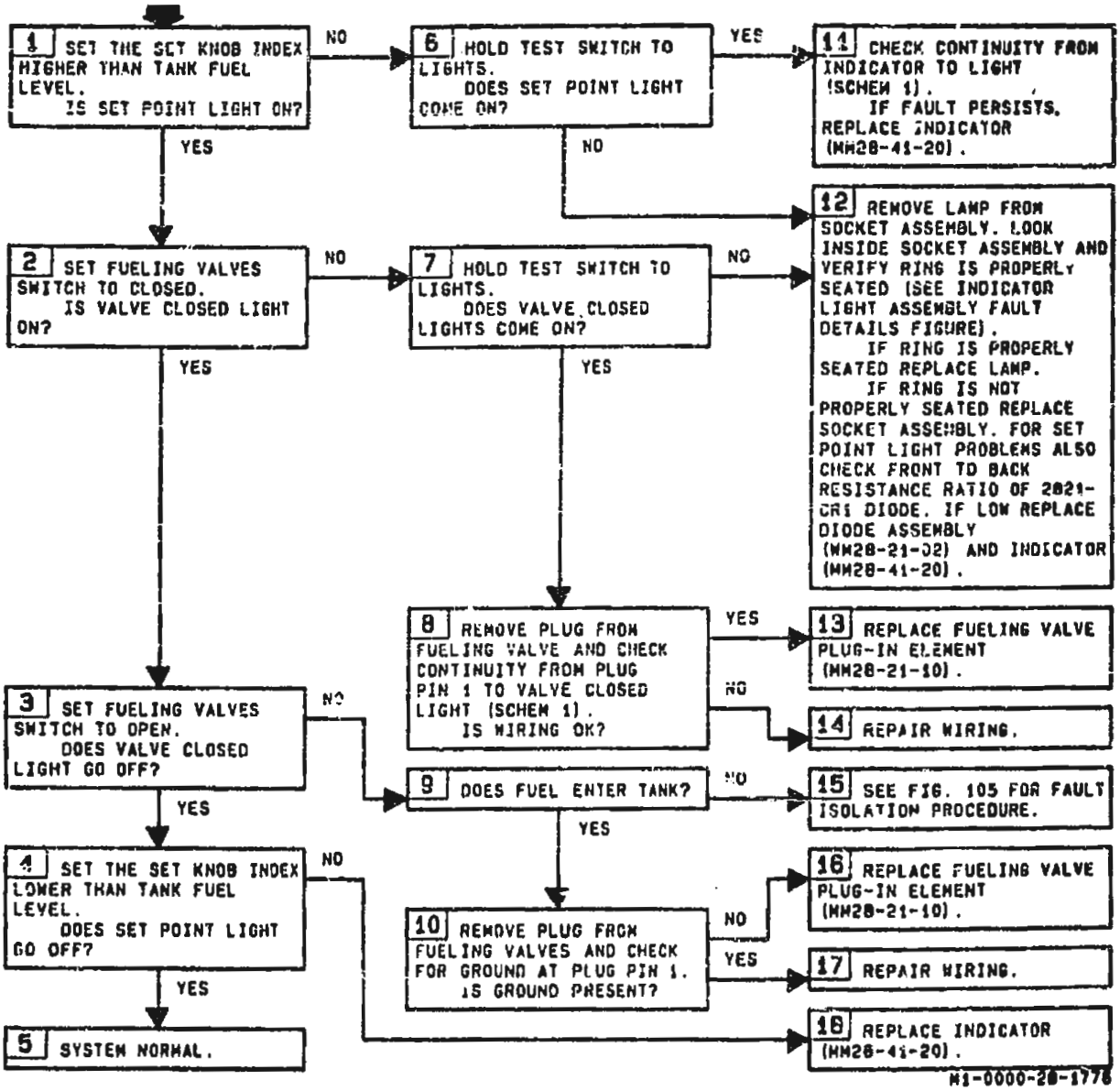
ISOLATION VALVE Amber Disagreement Light Problems
Figure 107 (Sheet 2)

R

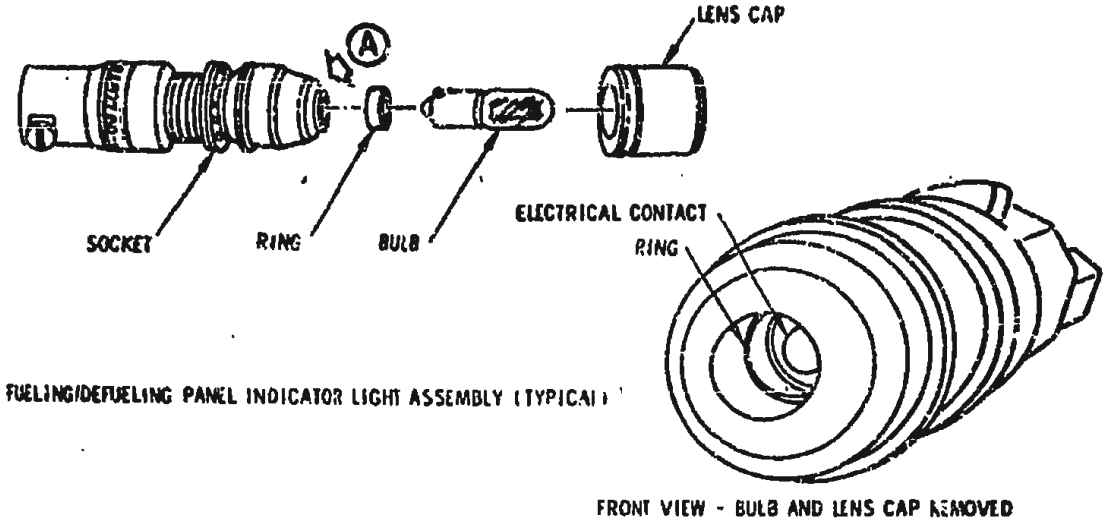
EFFECTIVITY: 025-026, 028-999

002B

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: C03-U18
GALLEY RIGHT-H18 THRU H19, G20
GALLEY LEFT-G21
FUELING/DEFUELING PANEL:
SYSTEM POWER SWITCH SET TO ON, SWITCH HOLDS IN PLACE
FUEL SYSTEM PANEL: REFUEL POWER ON LIGHT ON
AT LEAST ONE FUELING HOSE CONNECTED TO FUELING ADAPTER AND PRESSURE APPLIED
ALTERNATE METHOD: TURN ON ONE BOOST PUMP FOR TANK UNDER QUESTION, SET DEFUEL VALVE SWITCH FOR THAT TANK TO OPEN

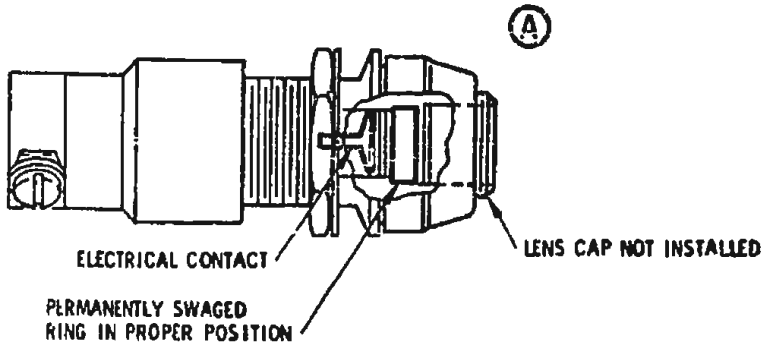

SET POINT OR VALVE CLOSED LIGHT CHECK OUT
1 SET THE SET KNOB INDEX HIGHER THAN TANK FUEL LEVEL. IS SET POINT LIGHT ON?
NO
YES
2 SET FUELING VALVES SWITCH TO CLOSED. IS VALVE CLOSED LIGHT ON?
NO
YES
3 SET FUELING VALVES SWITCH TO OPEN. DOES VALVE CLOSED LIGHT GO OFF?
NO
YES
4 SET THE SET KNOB INDEX LOWER THAN TANK FUEL LEVEL. DOES SET POINT LIGHT GO OFF?
NO
YES
5 SYSTEM NORMAL.
6 HOLD TEST SWITCH TO LIGHTS. DOES SET POINT LIGHT COME ON?
YES
NO
7 HOLD TEST SWITCH TO LIGHTS. DOES VALVE CLOSED LIGHTS COME ON?
NO
YES
8 REMOVE PLUG FROM FUELING VALVE AND CHECK CONTINUITY FROM PLUG PIN 1 TO VALVE CLOSED LIGHT (SCHEM 1). IS WIRING OK?
YES
NO
9 DOES FUEL ENTER TANK?
NO
YES
10 REMOVE PLUG FROM FUELING VALVES AND CHECK FOR GROUND AT PLUG PIN 1. IS GROUND PRESENT?
NO
YES
11 CHECK CONTINUITY FROM INDICATOR TO LIGHT (SCHEM 1). IF FAULT PERSISTS, REPLACE INDICATOR (MM28-41-20).
12 REMOVE LAMP FROM SOCKET ASSEMBLY. LOOK INSIDE SOCKET ASSEMBLY AND VERIFY RING IS PROPERLY SEATED (SEE INDICATOR LIGHT ASSEMBLY FAULT DETAILS FIGURE). IF RING IS PROPERLY SEATED REPLACE LAMP. IF RING IS NOT PROPERLY SEATED REPLACE SOCKET ASSEMBLY. FOR SET POINT LIGHT PROBLEMS ALSO CHECK FRONT TO BACK RESISTANCE RATIO OF 2021-CR1 DIODE. IF LOW REPLACE DIODE ASSEMBLY (MM28-21-02) AND INDICATOR (MM28-41-20).
13 REPLACE FUELING VALVE PLUG-IN ELEMENT (MM28-21-10).
14 REPAIR WIRING.
15 SEE FIG. 105 FOR FAULT ISOLATION PROCEDURE.
16 REPLACE FUELING VALVE PLUG-IN ELEMENT (MM28-21-10).
17 REPAIR WIRING.
18 REPLACE INDICATOR (MM28-41-20).
M1-0000-28-1776

CR SET POINT or VALVE CLOSED Lights Check Out
CR Figure 108

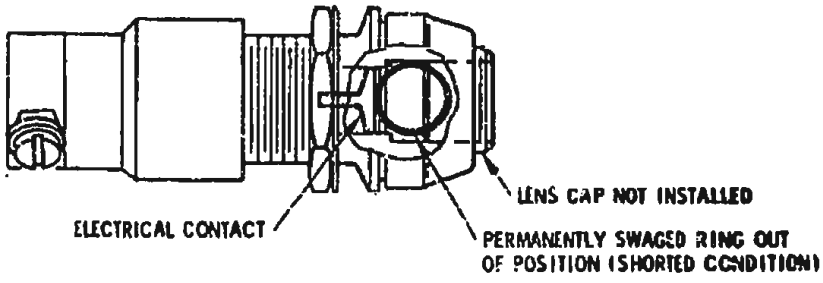


FUELING/DEFUELING PANEL INDICATOR LIGHT ASSEMBLY (TYPICAL)

FRONT VIEW - BULB AND LENS CAP REMOVED



INDICATOR LIGHT ASSEMBLY - CORRECT RING POSITION

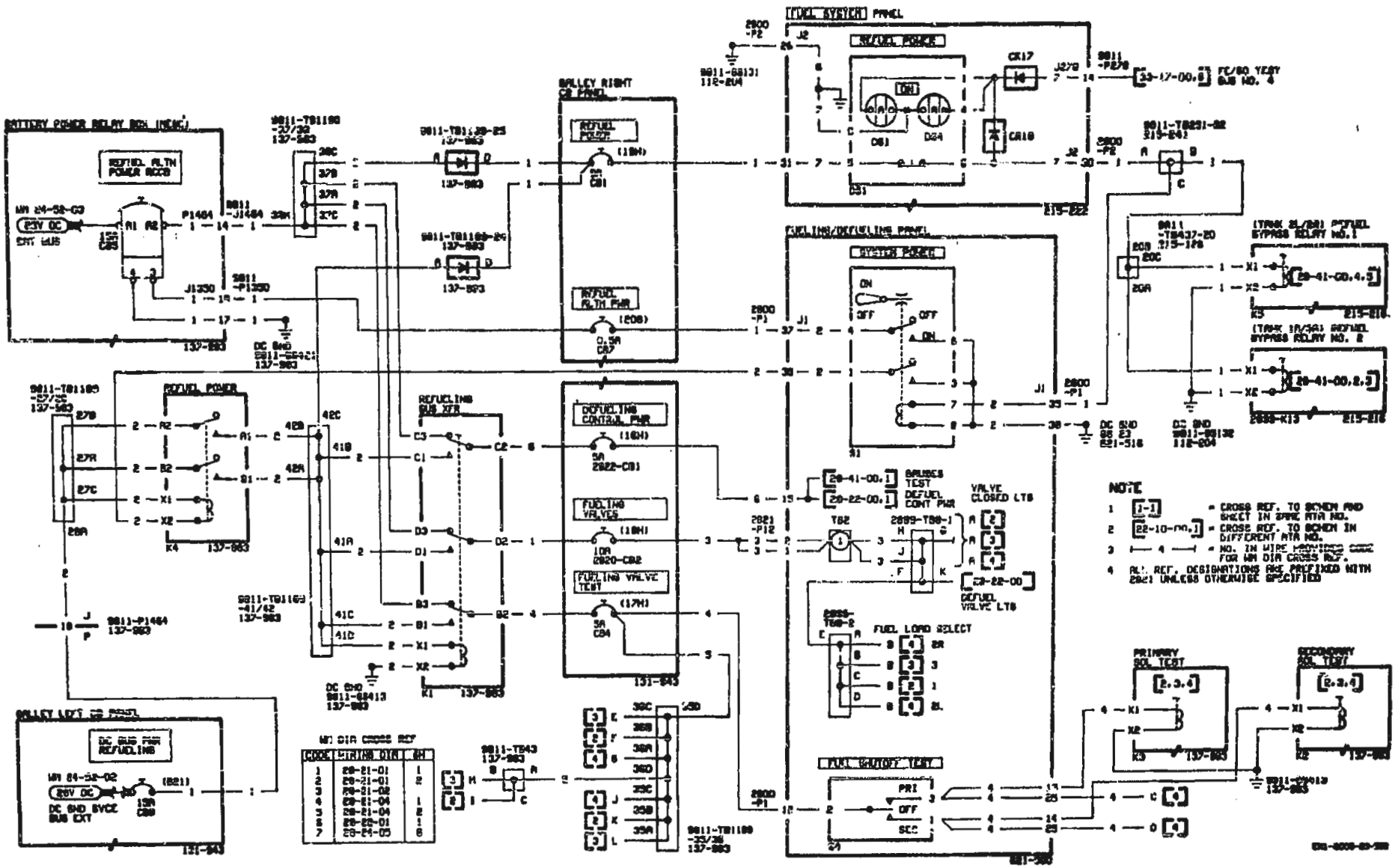


INDICATOR LIGHT ASSEMBLY- INCORRECT RING POSITION

M1-0009-28-1640

R
R

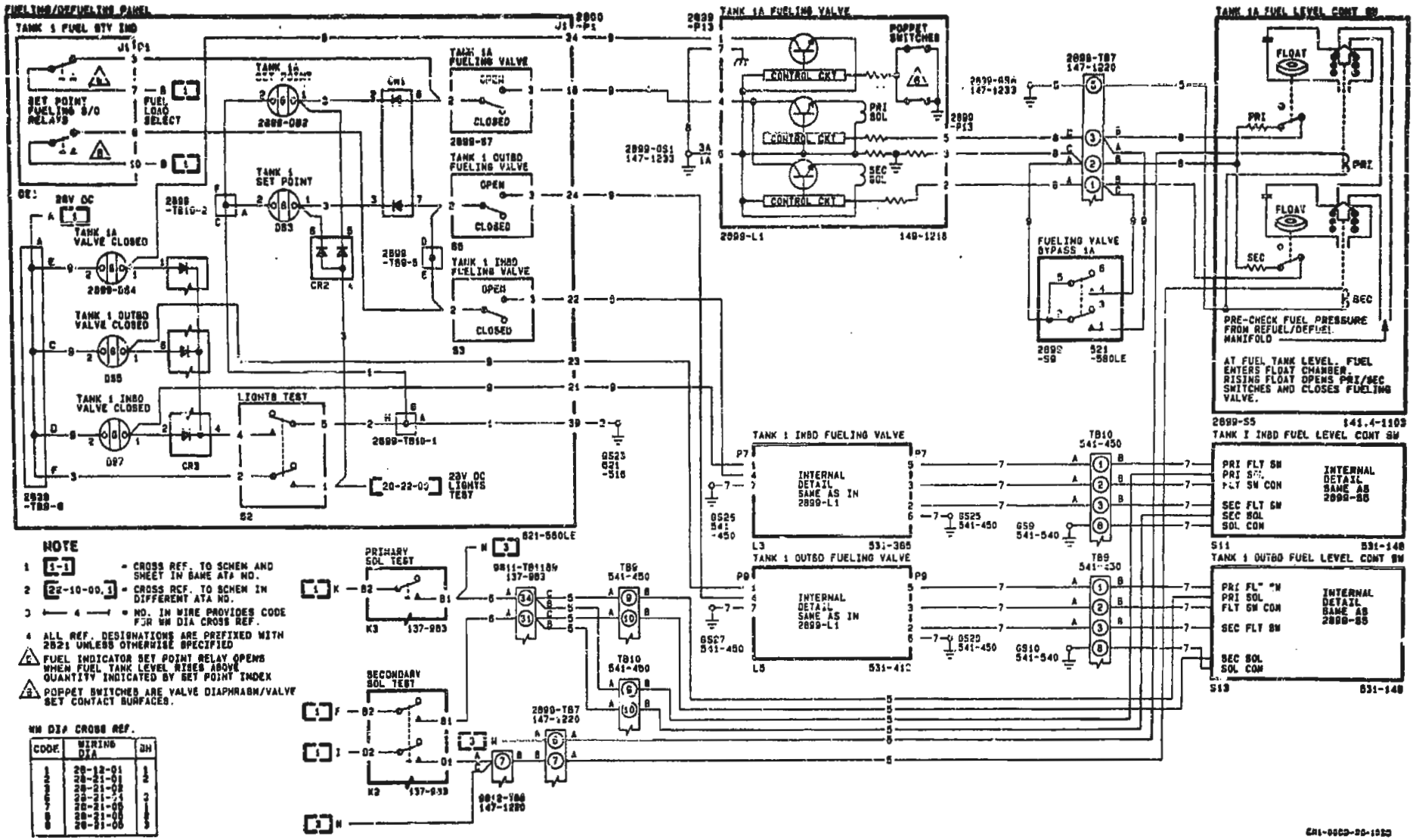
Indicator Light Assembly Fault Retails
Figure 109



Pressure Fueling System Power Distribution Schematic
SCHEM 1

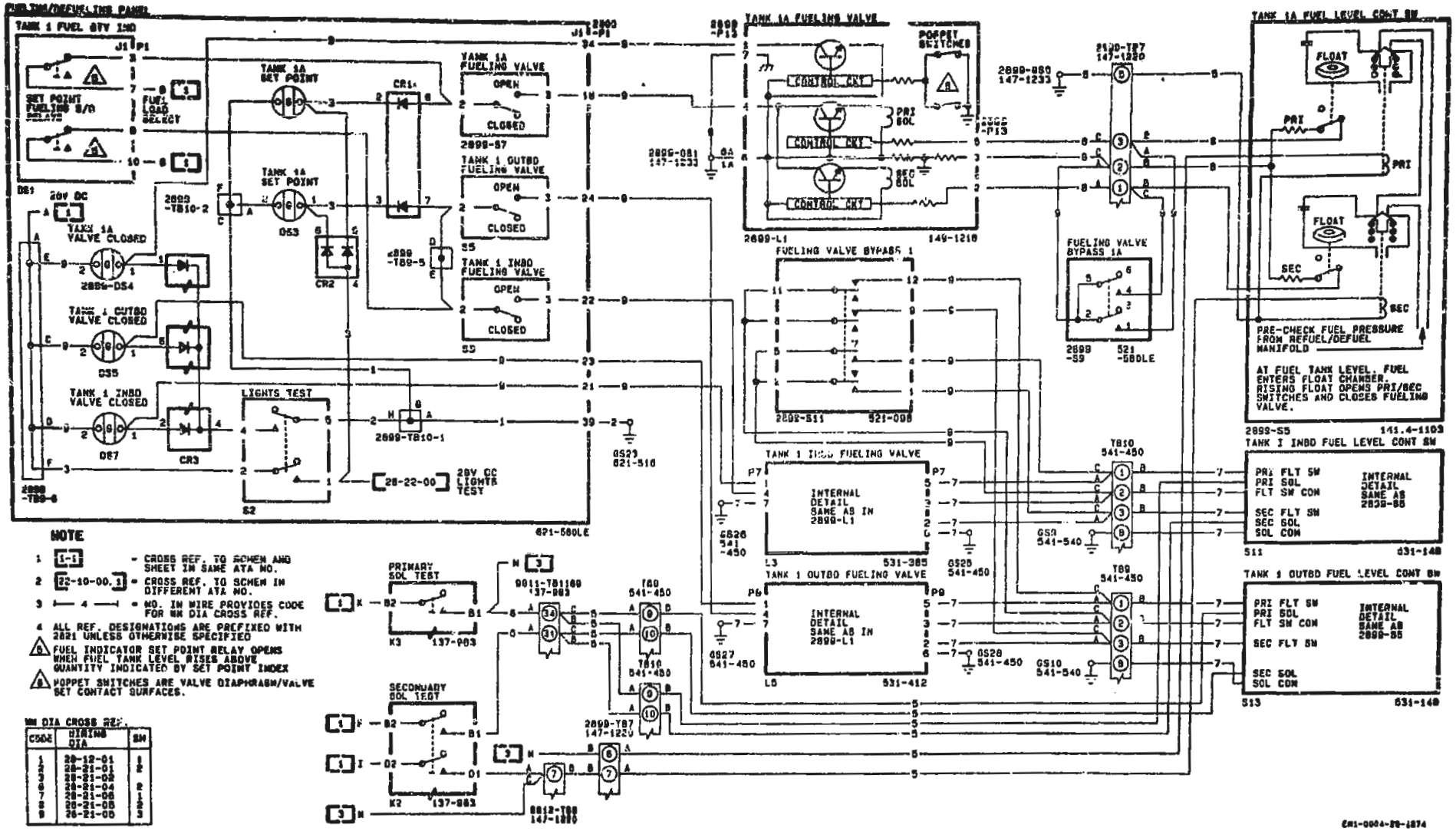
R EFFECTIVITY: 025-026, 028-999
R

002B


FUELING/DEFUELING PANEL
TANK 1 FUEL QTY IND
SET POINT FUELING S/O RELAYS
FUEL LOAD SELECT
TANK 1A SET POINT
TANK 1A FUELING VALVE
TANK 1 OUTBD FUELING VALVE
TANK 1 INBD FUELING VALVE
TANK 1A VALVE CLOSED
TANK 1 OUTBD VALVE CLOSED
TANK 1 INBD VALVE CLOSED
LIGHTS TEST
28V DC LIGHTS TEST
TANK 1A FUELING VALVE
POPPET SWITCHES
CONTROL CKT
PRI SOL
SEC SOL
FUELING VALVE BYPASS 1A
TANK 1A FUEL LEVEL CONT SW
FLOAT
PRI
SEC
PRE-CHECK FUEL PRESSURE FROM REFUEL/DEFUEL MANIFOLD
AT FUEL TANK LEVEL, FUEL ENTERS FLOAT CHAMBER. RISING FLOAT OPENS PRI/SEC SWITCHES AND CLOSES FUELING VALVE.
TANK 1 INBD FUEL LEVEL CONT SW
TANK 1 OUTBD FUEL LEVEL CONT SW
INTERNAL DETAIL SAME AS IN 2899-L1
INTERNAL DETAIL SAME AS 2899-S5
PRI FLT SW
PRI SOL
FLT SW COM
SEC FLT SW
SEC SOL
SOL COM
PRIMARY SOL TEST
SECONDARY SOL TEST
NOTE
1 [1-1] - CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2 [22-10-00,1] - CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3 — 4 — NO. IN WIRE PROVIDES CODE FOR WH DIA CROSS REF.
4 ALL REF. DESIGNATIONS ARE PREFIXED WITH 2821 UNLESS OTHERWISE SPECIFIED
A FUEL INDICATOR SET POINT RELAY OPENS WHEN FUEL TANK LEVEL RISES ABOVE QUANTITY INDICATED BY SET POINT INDEX
B POPPET SWITCHES ARE VALVE DIAPHRAGM/VALVE SEAT CONTACT SURFACES.
WH DIA CROSS REF.
CODE
WIRING DIA
SH

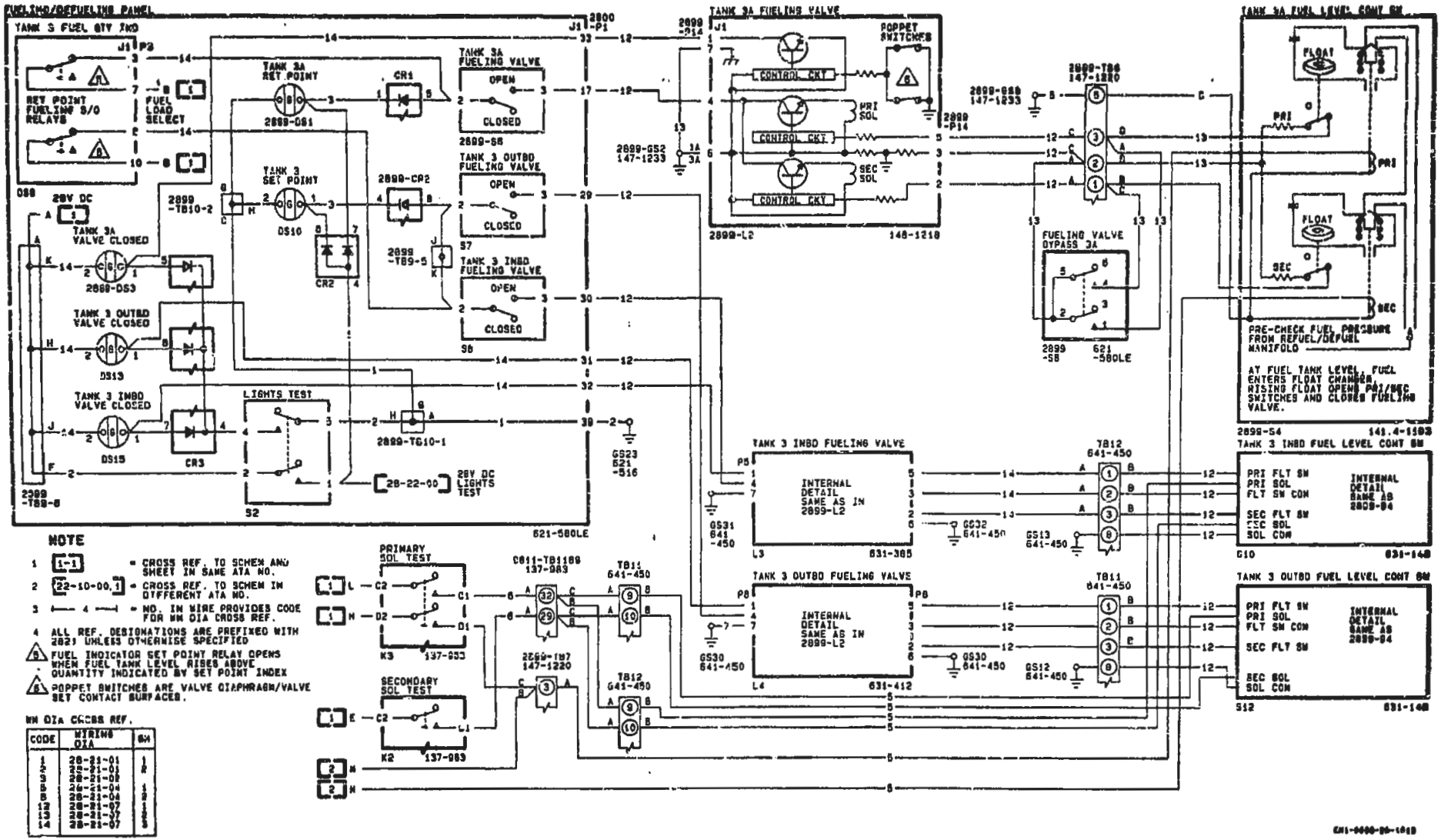
Tank 1A Pressure Fueling System Schematic
SCHEM 2

EFFECTIVITY: 025-026, 028-031


TANK 1 FUEL QTY IND
SET POINT FUELING S/O DELAY
FUEL LOAD SELECT
TANK 1A SET POINT
TANK 1A FUELING VALVE
OPEN
CLOSED
TANK 1 OUTBD FUELING VALVE
TANK 1 INBD FUELING VALVE
28V DC
TANK 1A VALVE CLOSED
TANK 1 OUTBD VALVE CLOSED
TANK 1 INBD VALVE CLOSED
LIGHTS TEST
28V DC LIGHTS TEST
TANK 1A FUELING VALVE
POPPET SWITCHES
CONTROL CKT
PRI SOL
SEC SOL
FUELING VALVE BYPASS 1
FUELING VALVE BYPASS 1A
TANK 1A FUEL LEVEL CONT SW
FLOAT
PRI
SEC
PRE-CHECK FUEL PRESSURE FROM REFUEL/DEFUEL MANIFOLD
AT FUEL TANK LEVEL, FUEL ENTERS FLOAT CHAMBER. RISING FLOAT OPENS PRI/SEC SWITCHES AND CLOSES FUELING VALVE.
TANK 1 INBD FUEL LEVEL CONT SW
TANK 1 OUTBD FUEL LEVEL CONT SW
INTERNAL DETAIL SAME AS IN 2899-L1
PRI FLT SW
PRI SOL
FLT SW COM
SEC FLT SW
SEC SOL
SOL COM
PRIMARY SOL TEST
SECONDARY SOL TEST
NOTE
1 [1-1] - CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2 [22-10-00,1] - CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3 - 4 - NO. IN WIRE PROVIDES CODE FOR WK DIA CROSS REF.
4 ALL REF. DESIGNATIONS ARE PREFIXED WITH 2821 UNLESS OTHERWISE SPECIFIED
5 FUEL INDICATOR SET POINT RELAY OPENS WHEN FUEL TANK LEVEL RISES ABOVE QUANTITY INDICATED BY SET POINT INDEX
6 POPPET SWITCHES ARE VALVE DIAPHRAGM/VALVE SET CONTACT SURFACES.
WK DIA CROSS REF.
CODE
WIRING DIA
SH

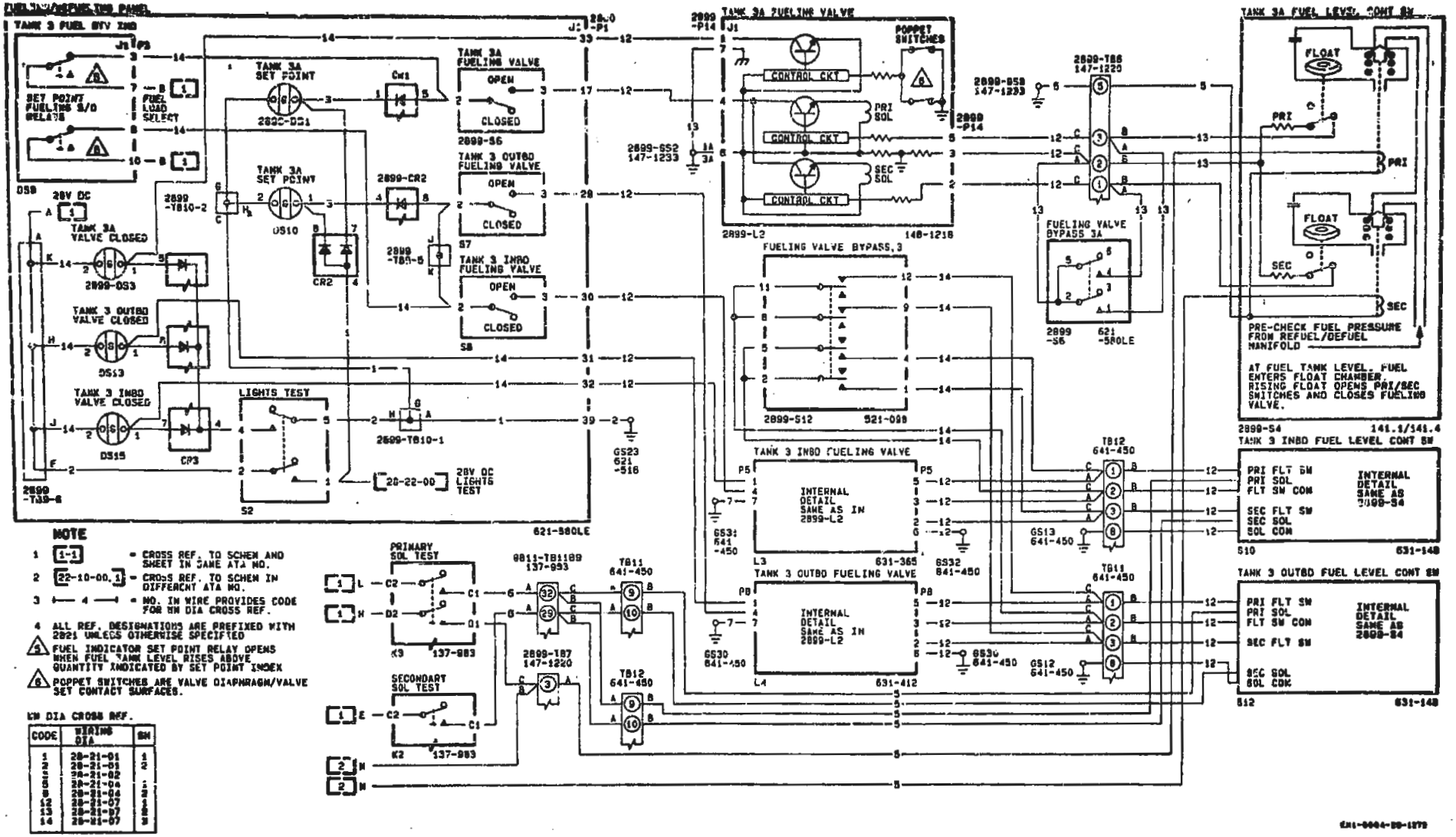
R Tank 1A Pressure Fueling System Schematic
R SCHEM 2

EFFECTIVITY: 032-999


FUELING/DEFUELING PANEL
TANK 3 FUEL QTY IND
RET POINT FUELING S/O RELAYS
FUEL LOAD SELECT
TANK 3A RET POINT
TANK 3 SET POINT
TANK 3A VALVE CLOSED
TANK 3 OUTBD VALVE CLOSED
TANK 3 INBD VALVE CLOSED
LIGHTS TEST
28V DC LIGHTS TEST
TANK 3A FUELING VALVE
TANK 3 OUTBD FUELING VALVE
TANK 3 INBD FUELING VALVE
OPEN
CLOSED
CONTROL CKT
PRI SOL
SEC SOL
POPPET SWITCHES
FUELING VALVE BYPASS 3A
INTERNAL DETAIL SAME AS IN 2899-L2
PRIMARY SOL TEST
SECONDARY SOL TEST
TANK 3A FUEL LEVEL CONT SW
TANK 3 INBD FUEL LEVEL CONT SW
TANK 3 OUTBD FUEL LEVEL CONT SW
FLOAT
PRI
SEC
PRE-CHECK FUEL PRESSURE FROM REFUEL/DEFUEL MANIFOLD
AT FUEL TANK LEVEL, FUEL ENTERS FLOAT CHAMBER. RISING FLOAT OPENS PRI/SEC SWITCHES AND CLOSES FUELING VALVE.
PRI FLT SW
PRI SOL
FLT SW COM
SEC FLT SW
SEC SOL
SOL COM
NOTE
1 [1-1] = CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2 [22-10-00,1] = CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3 —4— = NO. IN WIRE PROVIDES CODE FOR WH DIA CROSS REF.
4 ALL REF. DESIGNATIONS ARE PREFIXED WITH 2823 UNLESS OTHERWISE SPECIFIED
5 FUEL INDICATOR SET POINT RELAY OPENS WHEN FUEL TANK LEVEL RISES ABOVE QUANTITY INDICATED BY SET POINT INDEX
6 POPPET SWITCHES ARE VALVE DIAPHRAGM/VALVE SET CONTACT SURFACES.
WH DIA CROSS REF.
CODE | WIRING DIA | SH
1 | 28-21-01 | 1
2 | 28-21-01 | 2
5 | 28-21-05 | 1
6 | 28-21-04 | 1
8 | 28-21-04 | 2
12 | 28-21-07 | 1
13 | 28-21-07 | 2
14 | 28-21-07 | 3

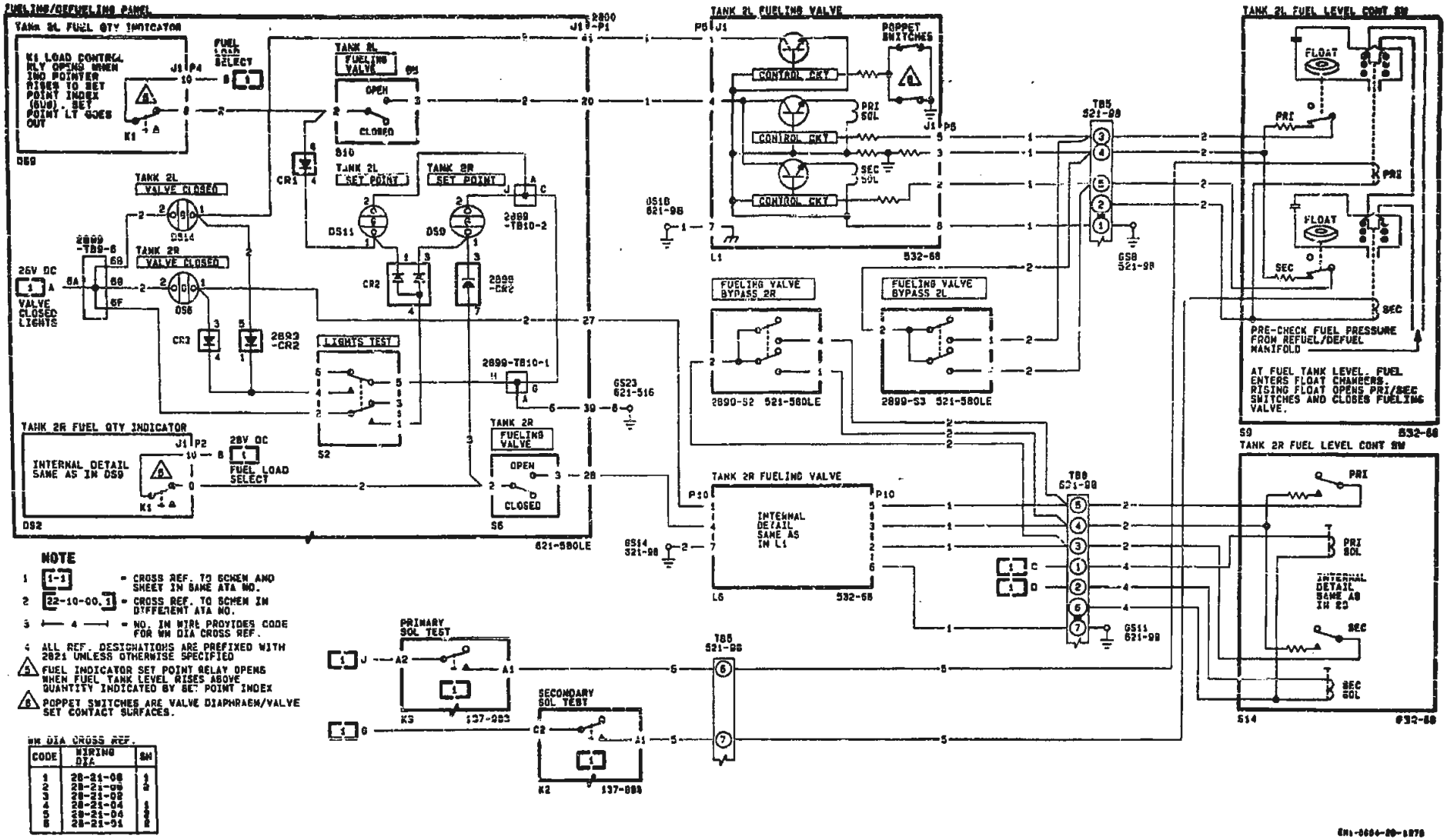
R Tank 3A Pressure Fueling System Schematic
R SCHEM 3

EFFECTIVITY: 025-026, 028-031


TANK 3 FUEL QTY IND
TANK 3A FUELING VALVE
TANK 3A FUEL LEVEL CONT SW
SET POINT FUELING S/O RELAYS
FUEL LOAD SELECT
TANK 3A SET POINT
TANK 3A FUELING VALVE OPEN CLOSED
TANK 3 OUTBD FUELING VALVE OPEN CLOSED
TANK 3 INBD FUELING VALVE OPEN CLOSED
28V DC
TANK 3A VALVE CLOSED
TANK 3 OUTBD VALVE CLOSED
TANK 3 INBD VALVE CLOSED
LIGHTS TEST
28V DC LIGHTS TEST
CONTROL CKT
PRI SOL
SEC SOL
POPPET SWITCHES
FUELING VALVE BYPASS,3
FUELING VALVE BYPASS 3A
INTERNAL DETAIL SAME AS IN 2899-L2
TANK 3 INBD FUELING VALVE
TANK 3 OUTBD FUELING VALVE
FLOAT
PRI
SEC
PRE-CHECK FUEL PRESSURE FROM REFUEL/DEFUEL MANIFOLD
AT FUEL TANK LEVEL, FUEL ENTERS FLOAT CHAMBER. RISING FLOAT OPENS PRI/SEC SWITCHES AND CLOSES FUELING VALVE.
TANK 3 INBD FUEL LEVEL CONT SW
TANK 3 OUTBD FUEL LEVEL CONT SW
PRI FLT SW
PRI SOL
FLT SW COM
SEC FLT SW
SEC SOL
SOL COM
INTERNAL DETAIL SAME AS 2899-S4
PRIMARY SOL TEST
SECONDARY SOL TEST
NOTE
1 [1-1] = CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2 [22-10-00,1] = CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3 — 4 — = NO. IN WIRE PROVIDES CODE FOR WH DIA CROSS REF.
4 ALL REF. DESIGNATIONS ARE PREFIXED WITH 2821 UNLESS OTHERWISE SPECIFIED
5 FUEL INDICATOR SET POINT RELAY OPENS WHEN FUEL TANK LEVEL RISES ABOVE QUANTITY INDICATED BY SET POINT INDEX
6 POPPET SWITCHES ARE VALVE DIAPHRAGM/VALVE SET CONTACT SURFACES.
WH DIA CROSS REF.
CODE | WIRING DIA | WH
1 | 28-21-01 | 1
2 | 28-21-01 | 2
5 | 28-21-02 | 5
8 | 28-21-04 | 8
12 | 28-21-07 | 12
13 | 28-21-07 | 13
14 | 28-21-07 | 14

R Tank 3A Pressure Fueling System Schematic
R SCHEM 3

EFFECTIVITY: 032-999



NOTE

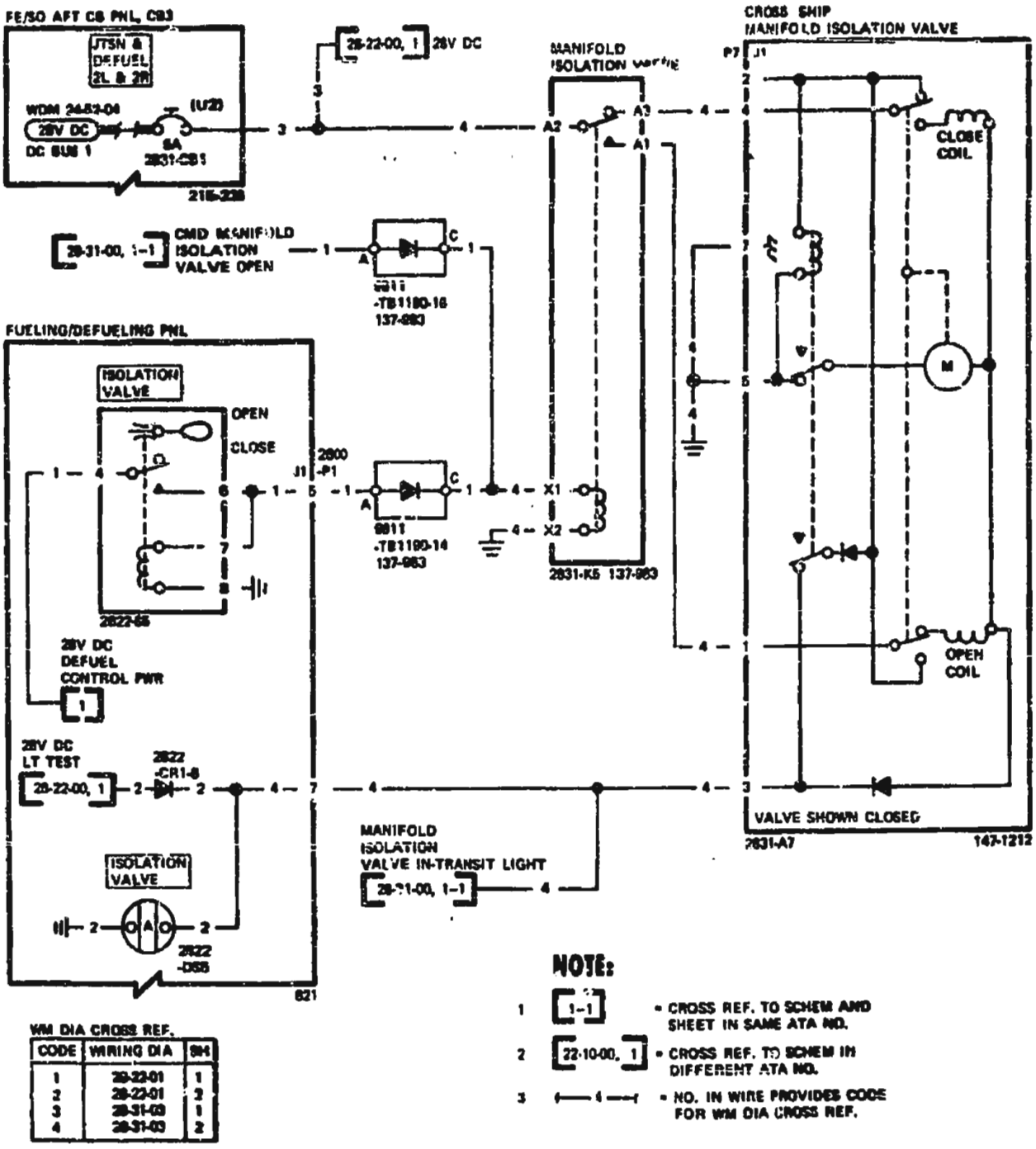
1. [1-1] = CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2. [22-10-00,1] = CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3. — 4 — = NO. IN WIRE PROVIDES CODE FOR WH DIA CROSS REF.
4. ALL REF. DESIGNATIONS ARE PREFIXED WITH 2821 UNLESS OTHERWISE SPECIFIED
5. FUEL INDICATOR SET POINT RELAY OPENS WHEN FUEL TANK LEVEL RISES ABOVE QUANTITY INDICATED BY SET POINT INDEX
6. POPPET SWITCHES ARE VALVE DIAPHRAGM/VALVE SET CONTACT SURFACES.

WH DIA CROSS REF.

CODE	WIRING DIA	SH
1	28-21-08	1
2	28-21-09	2
3	28-21-02	
4	28-21-04	1
5	28-21-04	2
6	28-21-01	1
		2

R Tank 2L/2R Pressure Fueling System Schematic
R SCHEM 4

EFFECTIVITY: 025-026, 028-999



WM DIA CROSS REF.

CODE	WIRING DIA	SH
1	28-22-01	1
2	28-22-01	2
3	28-31-03	1
4	28-31-03	2

NOTE:

1 [1-1] = CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.

2 [22-10-00, 1] = CROSS REF. TO SCHEM IN DIFFERENT ATA NO.

3 —4— = NO. IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.

EM1-0004-28-843

Fueling Manifold Isolation Valve Schematic
SCHEM 5

CR PRESSURE FUELING SYSTEM - MAINTENANCE PRACTICES

CR 1. Fueling Procedure (With Faulty Tank 1 or 3 Fuel Level Control Switch)

CR CAUTION: WHEN USING THIS PROCEDURE, DO NOT FILL TANK TO MAXIMUM CAPACITY.

CR A. On galley right circuit breaker panel, zone 131, open FUEL SYSTEM circuit breakers FUELING - VALVE TEST (17H) and FUELING - VALVES (18th).

CR B. Gain access to terminal modules 2821-TB9 and 2821-TB10 (Tank 1) or 2821-TB11 and 2821-TB12 (Tank 3) by opening wing access doors 541EB or 641EB.

CR C. Install jumpers between unused terminals in modules 1, 2, and 3 of the applicable terminal modules noted above (Ref. Fig. 201).

CR D. Close circuit breakers opened in Step (1) and commence fueling while monitoring appropriate fuel quantity gage to assure that fuel level does not exceed the SET POINT index setting.

CR E. Open the circuit breakers closed in the preceding step and remove the terminal module jumpers.

CR F. Close wing access door.

CR G. Close the circuit breakers.

CR 2. Fueling Procedure (With Faulty Fuel Level Control Switch in any Tank)

CR A. 2L & 2R tank fuel level control switches may be bypassed to open the 2L & 2R fueling valves electrically by actuating the bypass switches located in the left and right wing leading edge areas; only tanks 2L & 2R fueling systems incorporate the bypass switch installation.

CR B. All fueling valves, however, may be opened electrically by using the L-1011 fueling valve jumper P/N 28-00-0014. (Ref Tool and Equipment Manual) is a 125 foot cable with pyle connector on one end and an 28 VDC connector on the other. A 3 foot red streamer is attached to the pyle connector backshell.

CR (1) The purpose is to supply direct power to open any of
CR the fueling valves which fail to open due to a
CR malfunction other than the valve itself.

CR (2) Procedure

CR (a) For fueling valves 2L and 2R, remove wing panel
CR 521HB or 621HB respectively (First panel O.B. of
CR fueling override switch panel).

CR (b) Access to 1 or 3 fueling valve is wing panel 541EB
CR or 641EB respectively. (First panel O.B. of MLG)

CR (c) Tanks 1A and 3A fuel valves are accessible on
CR forward end of MLG wheel well L & R respectively.
CR MLG door should be opened for easy access.

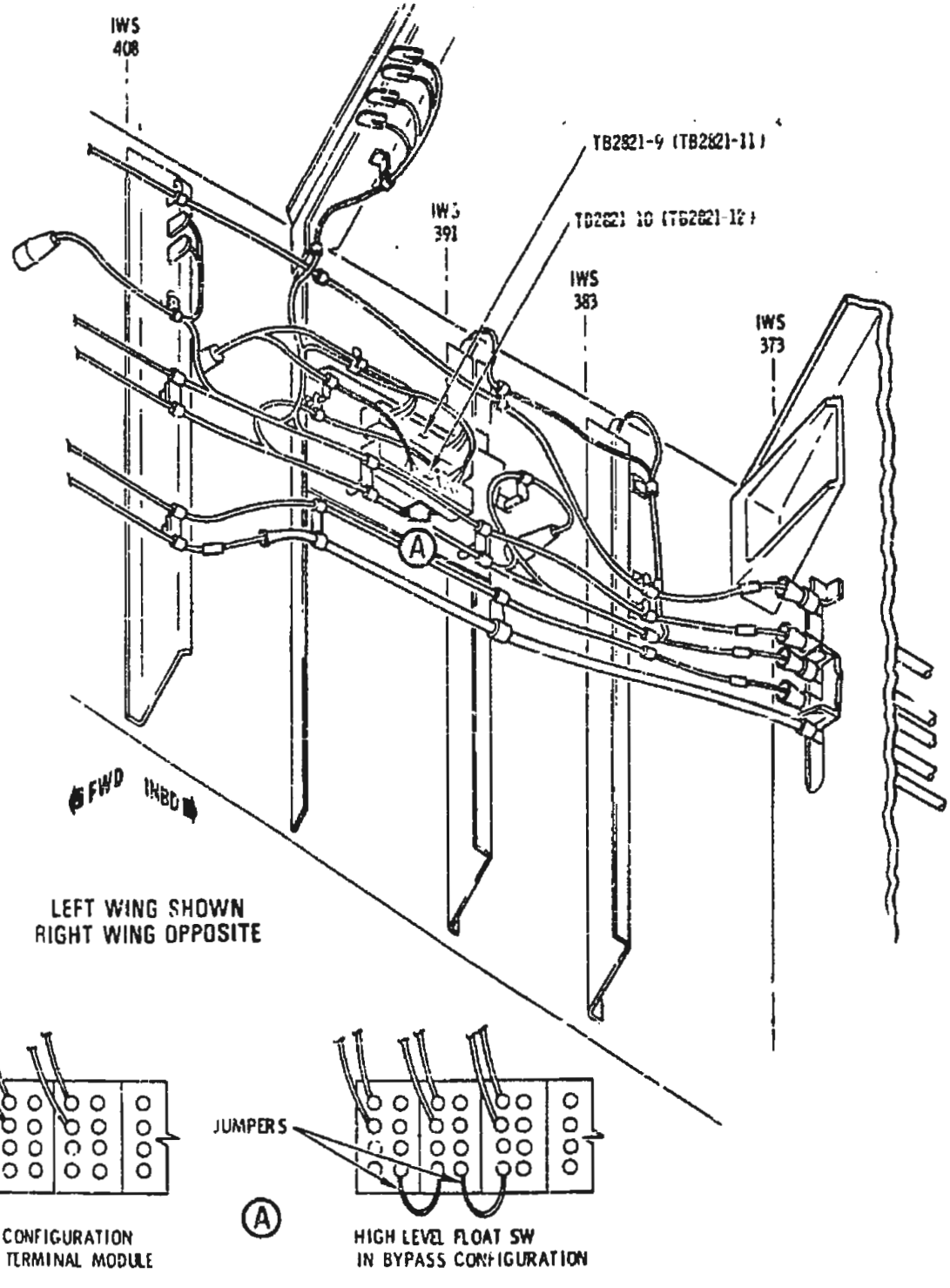
CR (d) Remove connector from suspect valve and install
CR jumper assembly.

CR (e) It should be noted that as long as the jumper
CR assembly is installed on the valve the valve will
CR remain OPEN. To terminate fueling for the
CR affected tank, remove the jumper assembly.

CR CAUTION: MAJOR FUEL SPILL CAN RESULT IF JUMPER IS LEFT
CR ON AFTER REQUIRED FUEL LEVEL IS REACHED.

CR (f) Assure entire assembly is removed prior to flight
CR and access panel is re-installed.

CR C. If the fueling valve does not open, the valve must be
CR replaced, either temporarily with a functioning valve from
CR another position, or a replacement valve from stock.



M1-0100-12-357

CR
CR
Tank 1 or 3 Fuel Level Control Switch Bypass
Figure 201

R
R
001B
EFFECTIVITY: ALL

FUELING/DEFUELING HOSE ADAPTERS - MAINTENANCE PRACTICES

1. General

The following procedure specifies tasks that must be performed to deactivate an inoperative fueling/defueling hose adapter.

2. Deactivation

NOTE: This deactivation procedure applies only when an aircraft is to be dispatched in accordance with the MEL.

A. Fueling/Defueling Hose Adapters

(1) If a broken adapter flange prevents installation of the adapter cap, stow cap securely to the adapter support bracket.

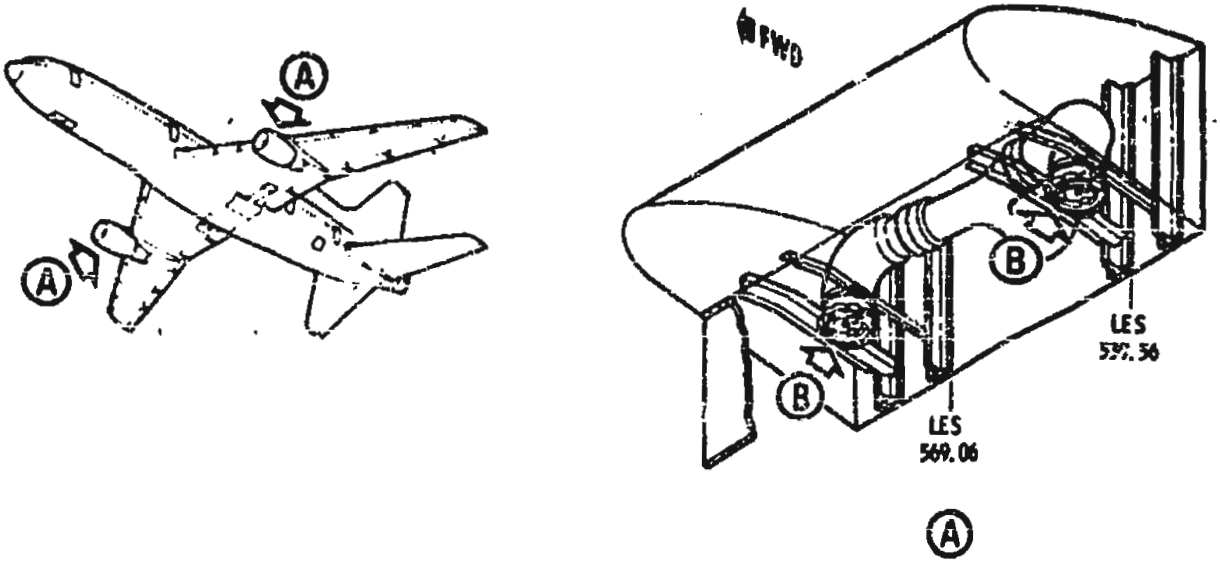
(2) Install placard at convenient location on adapter cap and FE/SO FUEL SYSTEM panel. Placard on FUEL SYSTEM panel must specify which fueling/defueling hose adapter is inoperative.

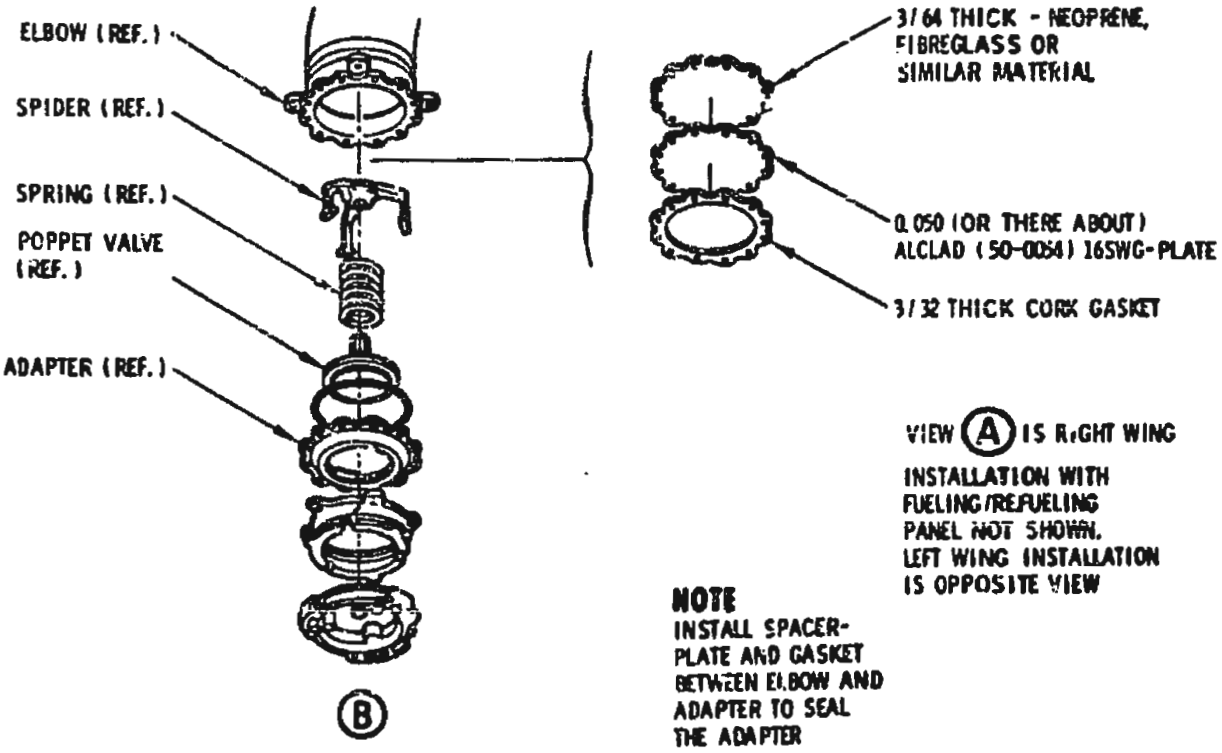
(3) Make appropriate entry in aircraft logbook.

CR 3. Approved Repair

CR A. If a failure of the fueling adapter spider, poppet valve or CR spring should occur at a location where replacement parts CR are not available - install a blanking plate and seal, as CR shown in Figure 201, to seal the adapter.

CR B. This is an airworthy repair. Advise downline stations and CR MCIMD that the repair has been made for follow-up CR corrections.




ELBOW (REF.)
SPIDER (REF.)
SPRING (REF.)
POPPET VALVE (REF.)
ADAPTER (REF.)
B
3/64 THICK - NEOPRENE, FIBREGLASS OR SIMILAR MATERIAL
0.050 (OR THERE ABOUT) ALCLAD (50-0054) 16SWG-PLATE
3/32 THICK CORK GASKET
VIEW (A) IS RIGHT WING INSTALLATION WITH FUELING/REFUELING PANEL NOT SHOWN. LEFT WING INSTALLATION IS OPPOSITE VIEW
NOTE
INSTALL SPACER-PLATE AND GASKET BETWEEN ELBOW AND ADAPTER TO SEAL THE ADAPTER

M1-0000-28-1613

CR
CR

Fueling Adapter Approved Repair
Figure 201

R EFFECTIVITY: ALL
R
0018

R R # PRESSURE FUELING VALVE AND ADAPTER ASSEMBLY REMOVAL AND INSTALLATION

1. General

R R R R R R R R R R R R R R R Two pressure fueling valve and adapter assemblies are installed at each fueling/defueling station located in wing leading edge sections, zones 521 and 621. Each unit consists of a spring-loaded poppet check valve, valve adapter cover and a tubular elbow that encloses the above components and directs fuel into the cross-ship fueling/defueling manifold. The assembly may be replaced as a unit or disassembled on the aircraft to permit replacement of poppet check valve components. A separately provisioned breakaway fuel nozzle flange (and cap) is mounted on the adapter and may be replaced without disturbing the poppet check valve or adapter cover (Ref. Fig. 401).

R R R R R R R R R R R R R R NOTE: Pressure fueling valve and adapter assemblies having -101 and -102 identities were equipped with poppet valve spiders that are attached to the adapter cover by screws. In later units having -103 and -104 identities, the spider is retained in its installed position by lugs engaged to locking detents in the adapter cover. Units having a -107 identity are equipped with a dual pin indexed breakaway flange that permits elimination of left and right part number designations.

2. Equipment and Materials

Hand-held container (approximately 5 gallons)

R Preformed packing (Ref. Fig. 401)

3. Referenced Procedures

12-11-11	Underwing Pressure-Fueling - Servicing
28-11-00	Tanks - Maintenance Practices
R 28-20-01	WIG-O-FLEX Couplings - Maintenance Practices
R 28-21-99	Fueling/Defueling Panel - Removal and Installation

R 4. Breakaway Flange Replacement

WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF. 28-11-00).

A. Removal

R (1) Disengage cap from breakaway flange. Remove lanyard R clamp attach screw to remove cap (Ref. Fig. 401).

R (2) Remove breakaway flange attach screws and separate R flange from adapter cover.

B. Installation

R NOTE: Breakaway flanges having index pins are engaged to R adapter covers at all locations with the cap lanyard R attach lug pointing toward the left wingtip.

R (1) Mount breakaway flange on adapter cover and install R flange attach screws (Ref. Fig. 401).

(2) Secure lanyard clamp to breakaway flange.

R (3) Engage cap and rotate to locked position.

5. Poppet Check Valve Replacement

A. Removal

R (1) On galley right circuit breaker panel, zone 134, open R and tag REFUEL - PWR CONT and REFUEL - ALTN PWR circuit R breakers.

On Flight Engineer/Second Officers aft circuit breaker R panel CB3, zone 215, open and tag all INBD/OUTBD BOOST R PUMP, JTSN & DEFUEL, and JTSN ARM circuit breakers (U1 through U18) and attach MAINTENANCE IN PROGRESS tag to FUEL SYSTEM panel.

R (2) Remove breakaway flange (Ref. Paragraph 4A).

R (3) Hold container under pressure fueling valve and R adapter. Depress poppet check valve and allow fuel to R drain into container.

R (4) Remove adapter cover attach screws and extract adapter R cover and poppet valve assembly from elbow.

CAUTION: FUELING VALVE SPRING EXERTS APPROXIMATELY 10-POUND FORCE BETWEEN POPPET AND APEX OF SPIDER. REMOVE SPIDER CAREFULLY.

(5) If spider is attached to adapter cover by screws, remove screws and separate spider, spring, and poppet from adapter cover. If spider legs are engaged to detents in the cover, compress poppet spring and disengage spider from cover detents.

B. Installation

(1) Verify that circuit breakers opened in Step 5A(1) are open and tagged.

NOTE: Before reinstalling an in-service valve poppet, verify that the bonded seal is not damaged or
R deteriorated. Seal must measure 0.012 - 0.018
R above surface of poppet disc and be free of any indentations or distortion.

(2) Place spring over poppet stem and engage stem to spider.

(3) Depress poppet spring and engage legs of spider to detents in adapter cover. If applicable, secure spider legs to adapter cover with screws.

(4) Check poppet assembly for proper seating against adapter cover.

(5) Using new preformed packing, install adapter cover on elbow adapter.

(6) Reinstall breakaway flange and cap (Ref. Para. 4B).

(7) Remove tags and close circuit breakers opened in Step 5A(1).

(8) Connect fueling hose and pressurize fueling/defueling manifold (Ref. 12-11-00). Check for fuel leakage around adapter cover.

(9) Depressurize fueling hose. Remove fueling hose and check for leaks around poppet (8).

(10) Install adapter cap.

6. Fueling Valve and Adapter Assembly Replacement

A. Removal

(1) Open and tag circuit breakers [Ref. Step 5A(1)] and install MAINTENANCE IN PROGRESS tag on FUEL SYSTEM panel.

(2) If replacing valve and adapter assembly at right wing fueling/defueling station, remove fueling/defueling panel (Ref. 28-21-99).

(3) Remove elbow to support bracket and brace attach fasteners (Ref. Fig 401).

(4) Disassemble elbow to manifold fitting connector (Ref. 28-20-01).

(5) Remove breakaway flange and cap. Retain for reinstallation.

B. Installation

(1) Hold fueling valve and adapter assembly in its installed position and assemble elbow to mainfold fitting coupling. At this time, tighten coupling only fingertight.

(2) Install elbow to support bracket and brace attach fasteners.

R (3) Tighten elbow to manifold connector to a torque of 360
R to 396 lb-inch.

(4) Install breakaway flange and cap (Ref. Para. 4B).

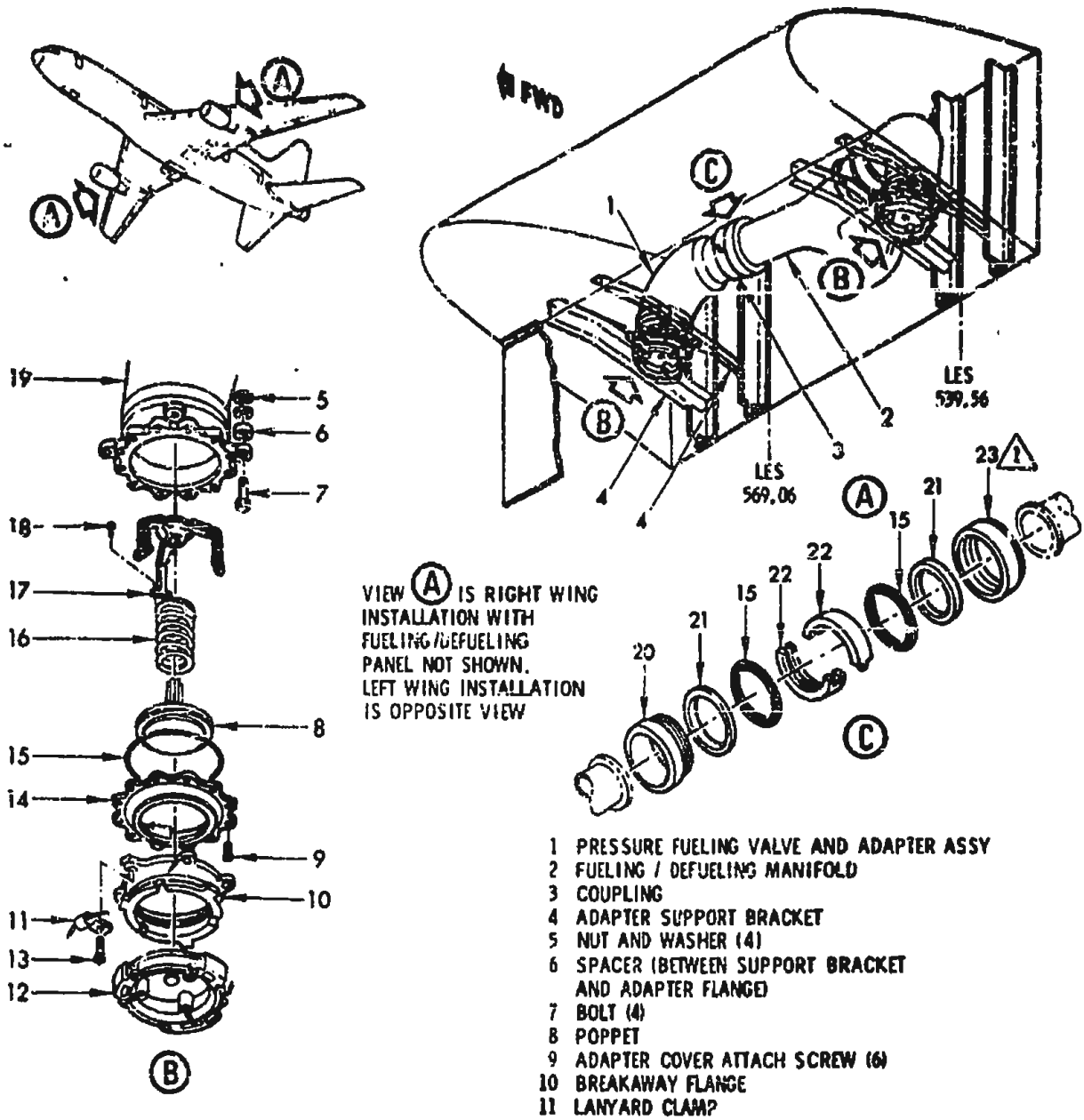
(5) If removed, reinstall fueling/defueling panel (Ref. 28-21-99).

(6) Attach fueling hose and pressurize refuel/defuel manifold. Check installation for leakage.

(7) Depressurize fuel hose and remove fueling hose.

(8) Install breakaway flange cap.

(9) Close circuit breakers opened in Step 6A(1).



VIEW (A) IS RIGHT WING INSTALLATION WITH FUELING/DEFUELING PANEL NOT SHOWN. LEFT WING INSTALLATION IS OPPOSITE VIEW

NOTE

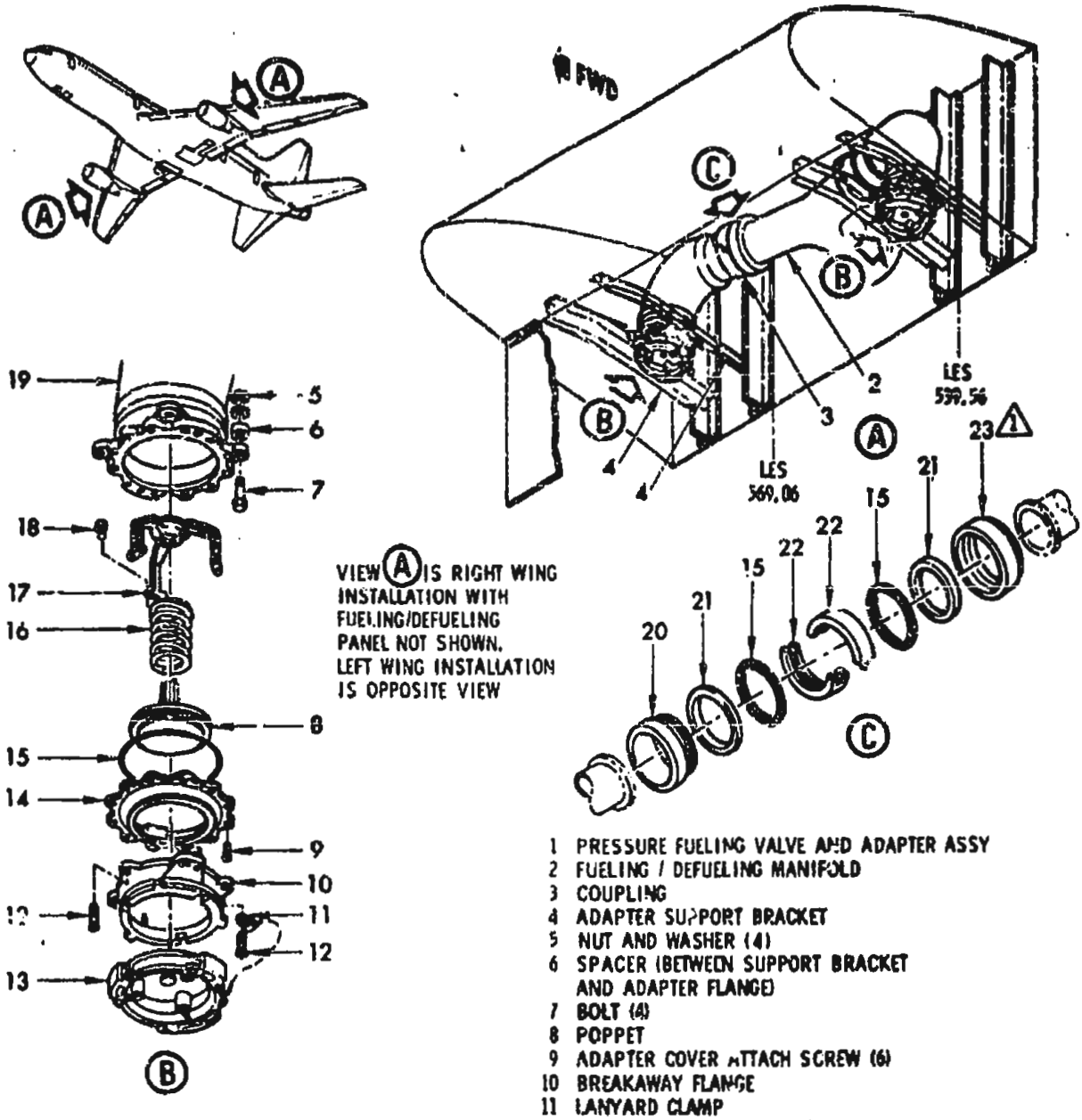
⚠1 TIGHTEN COUPLING NUT 360 TO 396 LB-INCH

2 PRESSURE FUELING VALVE AND ADAPTER CONSISTS OF ITEMS 8, 9, AND 14 THROUGH 19

1 PRESSURE FUELING VALVE AND ADAPTER ASSY
2 FUELING / DEFUELING MANIFOLD
3 COUPLING
4 ADAPTER SUPPORT BRACKET
5 NUT AND WASHER (4)
6 SPACER (BETWEEN SUPPORT BRACKET AND ADAPTER FLANGE)
7 BOLT (4)
8 POPPET
9 ADAPTER COVER ATTACH SCREW (6)
10 BREAKAWAY FLANGE
11 LANYARD CLAMP
12 CAP
13 FLANGE ATTACH SCREW (6)
14 ADAPTER COVER
15 PREFORMED PACKING
16 SPRING
17 SPIDER
18 SPIDER ATTACH SCREW (6)
19 ELBOW
20 BODY
21 WASHER
22 RETAINER
23 NUT ⚠1

MI-0004-28-409

R Pressure Fueling Valve and Adapter Assembly
R Removal and Installation
R Figure 401



VIEW (A) IS RIGHT WING INSTALLATION WITH FUELING/DEFUELING PANEL NOT SHOWN. LEFT WING INSTALLATION IS OPPOSITE VIEW

1 PRESSURE FUELING VALVE AND ADAPTER ASSY
2 FUELING / DEFUELING MANIFOLD
3 COUPLING
4 ADAPTER SUPPORT BRACKET
5 NUT AND WASHER (4)
6 SPACER (BETWEEN SUPPORT BRACKET AND ADAPTER FLANGE)
7 BOLT (4)
8 POPPET
9 ADAPTER COVER ATTACH SCREW (6)
10 BREAKAWAY FLANGE
11 LANYARD CLAMP
12 FLANGE ATTACH SCREW (6)
13 CAP
14 ADAPTER COVER
15 PREFORMED PACKING
16 SPRING
17 SPIDER
18 SPIDER ATTACH SCREW (6)
19 ELBOW
20 BODY
21 WASHER
22 RETAINER
23 NUT ⚠1

NOTE

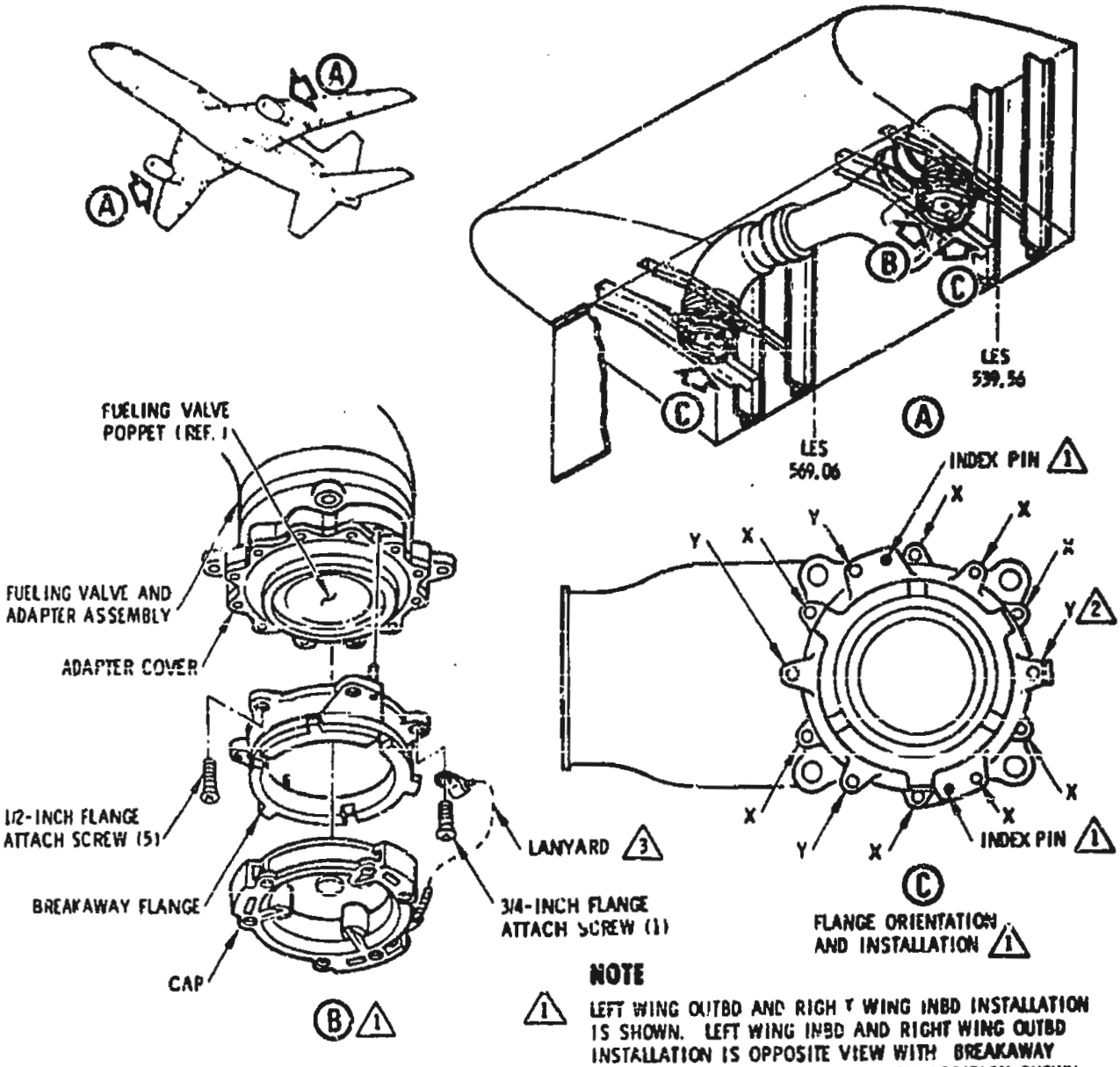
⚠1 TIGHTEN COUPLING NUT 360 TO 396 LB-INCH

2 PRESSURE FUELING VALVE AND ADAPTER CONSISTS OF ITEMS 8, 9, AND 14 THROUGH 19

3 REFER TO FIGURE 402 FOR REMOVAL -INSTALLATION OF ITEM 10 AND 13

M1-0001-20-1352

R Pressure Fueling Valve and Adapter Assembly
R Removal and Installation
R Figure 401



NOTE

1. LEFT WING OUTBD AND RIGHT WING INBD INSTALLATION IS SHOWN. LEFT WING INBD AND RIGHT WING OUTBD INSTALLATION IS OPPOSITE VIEW WITH BREAKAWAY FLANGE INSTALLED 180 DEGREES FROM POSITION SHOWN. BREAKAWAY FLANGE IS INDEXED TO FUELING VALVE AND ADAPTER ASSEMBLY ELBOW BY TWO LOCATING PINS WITH EMBOSSED WORD "TOP" FACING FORWARD
2. SCREWS (6) INSTALLED AT LOCATION X SECURE COVER TO ELBOW FLANGE. SCREWS (6) AT LOCATION Y ARE FLANGE ATTACH SCREWS
3. CAP LANYARD IS ATTACHED TO FLANGE AT LOCATION INDICATED BY 2

M1-0100-28-1350

Breakaway Flange - Removal and Installation
Figure 402

FUELING/DEFUELING MANIFOLD ISOLATION VALVE - MAINTENANCE PRACTICES

1. General

The following procedure specifies the method used to deactivate an inoperative fueling/defueling manifold isolation valve. The valve is manually opened and electrically deactivated. With the valve open, do not simultaneously refuel from both underwing fueling stations.

2. Deactivation

R NOTE: This deactivation procedure applies only when an aircraft
R is to be dispatched in accordance with the MEL.

A. Fueling/Defueling Manifold Isolation Valve

(1) In the hydraulic service center, zone 147, disconnect the wiring harness connector from the fueling/defueling manifold isolation valve actuator.

(2) Install protective caps on the wiring harness connector and actuator receptacle. Stow connector.

(3) Move actuator override lever to the OPEN position.

(4) Install placard at fueling/defueling control panel, zone 621FB. Placard must state that the fueling/defueling manifold isolation valve has been manually opened.

(5) Make appropriate entry in aircraft log book.

R FUELING/DEFUELING MANIFOLD ISOLATION VALVE
R REMOVAL AND INSTALLATION

R 1. Equipment and Materials

R Preformed packing (Ref. Fig. 401)

R Grease, Fluorosilicone, Dow Corning FS1291, or equivalent

R Hand-held container Retainer Pin (Ref. Fig. 401)

R 2. Referenced Procedures

R	6-40-00	Exterior Access Doors and Panels
R	6-50-00	Interior Access Doors and Removable Panels
R	12-11-11	Pressure Fueling - Servicing
R	24-00-00	Electrical Power System - Maintenance Practices
R	28-11-00	TANKS - Maintenance Practices
R	28-20-01	WIG-O FLEX Couplings - Maintenance Practices
R	28-22-00	Defueling - Maintenance Practices

R 3. Removal/Installation

R WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL
R SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY
R GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES.
R OBSERVE ALL SAFETY REGULATIONS (REF. 28-11-00).

R A. Valve Body Removal

R NOTE: To minimize the possibility of fuel spillage into the
R center section do not remove valve body unless a
R replacement is available for immediate installation.

R (1) Apply external electrical power (Ref. 24-00-00).

R (2) Open fueling/defueling panel access door 621 FB and
R verify that all DEFUEL VALVES lights are out.

R (3) Gain access to aft bay of wing center section through
R appropriate entry point (Ref. 6-50-00).

(4) If not required for other maintenance, turn off external electrical power (Ref. 24-00-00).

(5) On FE/SO aft circuit breaker panel CB3, zone 215, open and tag following circuit breakers:

JTSN DEFUEL 2L & 2R (U2) or (U3)

JTSN ARM (U18)

All Boost pump circuit breakers on row U

(6) Install MAINTENANCE IN PROGRESS tag on FE/SO Fuel System panel.

(7) Remove manifold isolation valve actuator (Ref. 28-21-04).

(8) Disassemble Wiggins couplings (Ref. Fig. 401) at manifold isolation valve body (Ref. 28-20-01).

(9) Hold valve body while man in hydraulic service center removes four valve attach studs. Retain spacer washers installed between studs and center section spar web.

(10) Remove valve body from aircraft.

B. Valve Body Installation

(1) Install new preformed packing on valve body flange.

R (2) Place spacer washers removed in Step 3A(9) on valve
R support studs. Hold valve body in its installed
R position and install the studs. Tighten studs to a
R torque value of 60-65 lb-inch.

R (3) Reconnect manifold tubing to valve body by reassembling Wiggins couplings (Ref. 28-20-01).

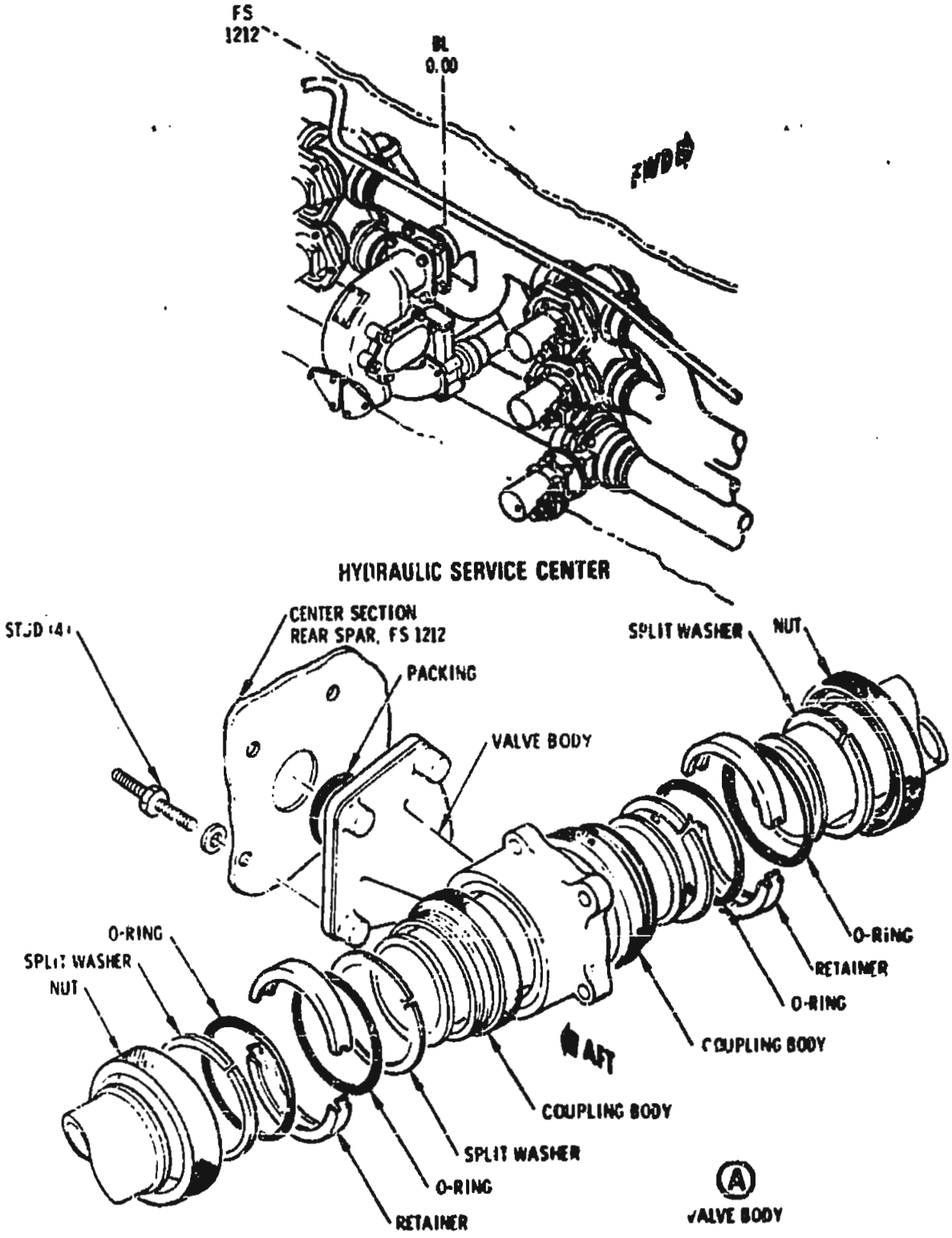
(4) Reinstall actuator (Ref. 28-21-04).

(5) Remove tags and close circuit breakers opened in Step 3A(5).

(6) Check out isolation valve operation (Ref. 28-21-04).

(7) Pressurize fueling/defueling valve by either refueling cross-ship or cross-ship transfer of fuel (Ref. 12-11-11). Check for fuel leakage at valve.

(8) Remove electrical power (Ref. 24-00-00).



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R Fueling/Defueling Manifold Isolation Valve - Removal and
R Installation
R Figure 401

R EFFECTIVITY: ALL

001B

R (9) Reinstall wing center section access panels.

FUELING/DEFUELING MANIFOLD ISOLATION VALVE ACTUATOR REMOVAL AND INSTALLATION

1. Equipment and Materials

R Preformed packing (Ref. Fig. 401)

Grease, Fluorosilicone, Dow Corning FS1291, or equivalent

R Retainer Pin (Ref. Fig. 401)

2. Referenced Procedures

	6-40-00	Exterior Access Doors and Panels
	6-50-00	Interior Access Doors and Removable Panels
	12-11-11	Pressure Fueling - Servicing
	24-00-00	Electrical Power System - Maintenance Practices
R	28-11-00	Tanks - Maintenance Practices
	28-20-01	WIG-O-FLEX Couplings - Maintenance Practices
	28-22-00	Defueling - Maintenance Practices

3. Removal/Installation

WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF. 28-11-00).

A. Actuator Removal

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag:

JTSN & DEFUEL 2L & 2R (U2) or (U3) circuit breaker.

(2) Open hydraulic service center access door 147AB (Ref. 6-40-00) and locate manifold isolation valve on rear beam of wing center box section (Ref. Fig. 401).

(3) Disconnect electrical harness connector.

(4) If not in CLOSED position, move actuator position handle to CLOSED position.

(5) Remove actuator attach nuts and washers.

(6) Separate actuator from valve body.

(7) Remove U-shaped retaining pin from actuator shaft adapter.

(8) Remove adapter and retain for reinstallation on new actuator.

B. Actuator Installation

(1) Verify that circuit breakers opened in Step 3A(1) are opened and tagged.

(2) Verify that actuator position handle is in CLOSED position.

(3) Place valve drive shaft adapter on actuator shaft.

(4) Insert new adapter retaining pin through adapter. Lock pin in place by bending over the pin tips.

(5) Mount actuator on the valve body/actuator support studs and engage adapter to valve drive shaft.

(6) Install actuator attach washers and nuts. Tighten nuts 15 to 20 lb in. higher than running torque.

(7) Connect electrical harness plug and install lock-wire.

(8) Remove tags and close circuit breakers opened in Step 3A(1).

R (9) Verify that DC BUS PWR REFUELING and FUEL SYSTEM
R circuit breakers on galley circuit breaker panels, zone
R 130, are closed.

R (10) Turn on electrical power (Ref. 24-00-00).

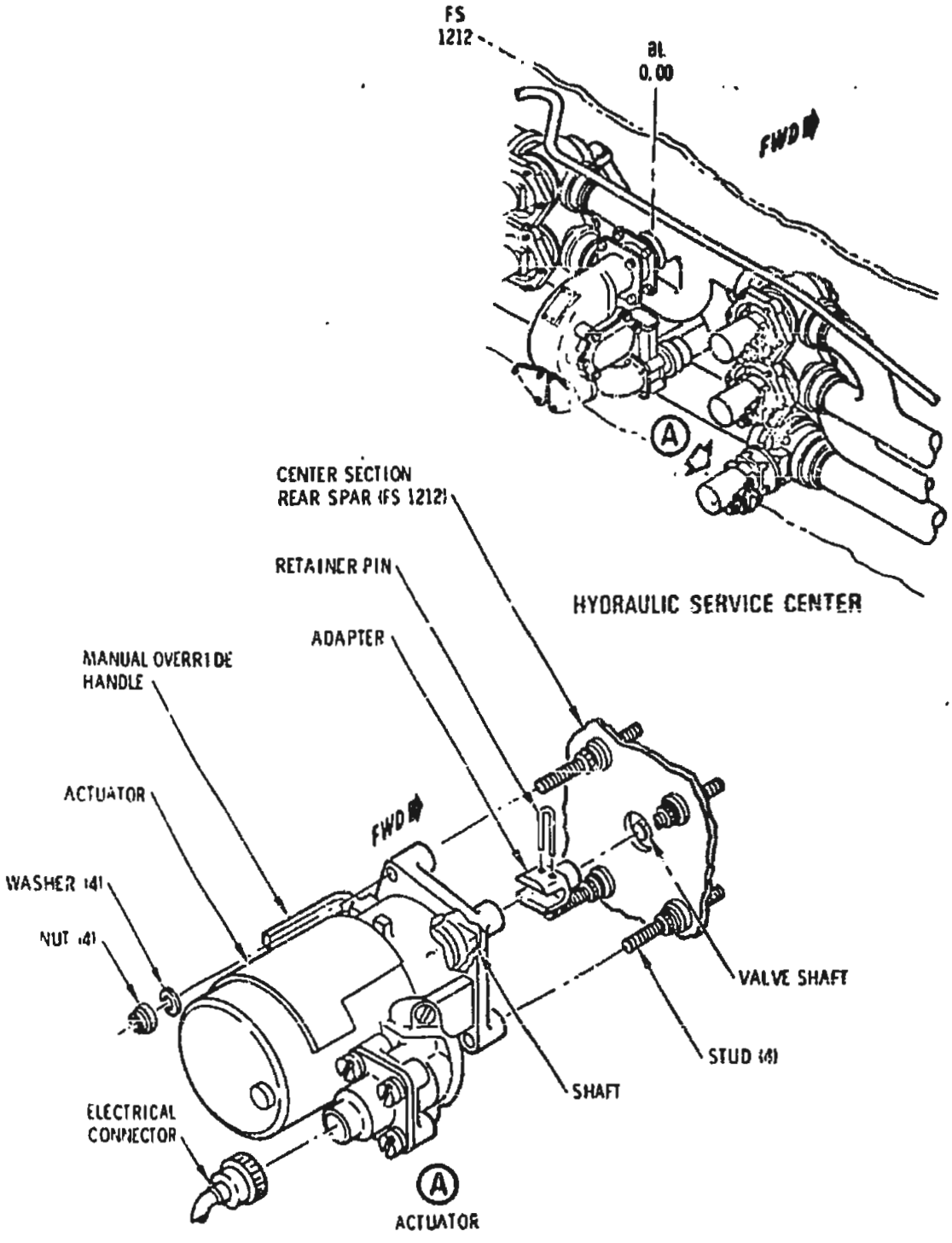
R (11) Open fueling/defueling panel access door 621FB and
R select SYSTEM POWER switch ON.

R (12) Select ISOLATION VALVE switch OPEN position. Verify that amber VALVE CLOSED light comes on (approximately one second) then goes out. Have man in hydraulic service center compartment verify smooth valve operation to open position.

R (13) Select ISOLATION VALVE CLOSED position. Verify that
R amber light comes on, then goes out, and valve operates
R smoothly to closed position.

R (14) Set SYSTEM POWER switch to OFF position and close panel
R access door.

R (15) Turn off electrical power (Ref. 24-00-00).



M1-0000-28-1550

R Manifold Isolation Valve Actuator - Removal and Installation
R Figure 401

FUELING VALVES - MAINTENANCE PRACTICES

1. General

The following procedure specifies the method used to verify that an inoperative refuel shutoff valve is closed and deactivated.

2. Deactivation

NOTE: This deactivation procedure applies only when an aircraft is to be dispatched in accordance with the MEL.

Electrical power is assumed to be turned on.

A. Gain access to fueling/defueling control panel, zone 621FB and place the SYSTEM POWER SWITCH to ON.

CR (1) Close the fueling valves.

CR (2) Perform light test by holding LIGHTS switch in TEST position and verify all panel lights are illuminated. Release LIGHTS switch and verify fueling valves VALVE CLOSED lights are illuminated.

CR (3) Verify that the fuel valve to be deactivated is closed by:

CR (a) Pressurizing the fueling manifold with the fueling truck (or equiv.); opening the fueling manifold isolation valve as required; and checking for any fuel flow on truck fuel meter, or;

CR (b) Pressurizing the fueling manifold by operating any of the fuel boost pumps and associated defuel valve other than the fuel tank with the deactivated fueling valve; opening the fueling manifold isolation valve as required; and checking for any fuel transfer.

CR (c) If no fuel flow or transfer occurs, continue with the fuel valve deactivation procedure.

CR B. Attach appropriate tag to refuel/defueling panel, that states which refuel shutoff valve(s) is deactivated.

CR C. Position SYSTEM POWER SWITCH to off and close access door.

CR D. Open following associated circuit breaker:

Open and tag circuit breaker FUEL SYSTEM - FUELING VALVES (18H) on galley right circuit breaker panel, zone 130.

CR E. Gain access to affected refuel shutoff valve through the following access doors.

For tank 1 and 3, access doors 541EB or 641EB.

For tank 2L and 2R, access doors 521HB or 621HB.

For aircraft with tank 1A and 3A, locate affected refuel shutoff valve(s) on center section aft beam in respective left and right MLG wheel well areas.

CR F. Disconnect and stow wiring harness connector.

CR G. Close access doors opened in Step E.

CR H. Remove tag and reset circuit breaker opened in Step D.

CR I. Install placard at convenient location in flight station. Placard must specify which valve (or valves) is deactivated.

CR J. Make appropriate entry in aircraft log book.

FUEL LEVEL CONTROL SWITCHES MAINTENANCE PRACTICES

1. General

The following procedure is to be performed if aircraft is to be dispatched with a fuel level control switch inoperative.

2. Deactivation

NOTE: This deactivation procedure applies only when an aircraft is to be dispatched in accordance with the MEL.

A. Fuel Level Control Switch

R (1) Underwing pressure fueling is to be performed as
R outlined in Maintenance Manual section 12-11-11,
R Servicing.

R (2) Install fuel level control switch inoperative placard on fueling/defueling control panel, zone 621. Placard should state which control switch is inoperative.

R (3) Make appropriate entry in aircraft log book.

TANK 1, 2L, 2R AND 3 FUEL LEVEL CONTROL SWITCHES REMOVAL AND INSTALLATION

1. General

Three identical float actuated fuel level control switch assemblies are installed in each wing: two in fuel tanks No. 1 and 3, and one each in fuel tanks No. 2L and 2R. The switches in tanks No. 1 and 3 are mounted in tandem on a common support bracket. Wiring from these switches is routed through a common conduit to terminal boards mounted on the wing rear beam between the two fueling valves controlled by these switches. The inboard valve is controlled by the forward switch and the outboard valve is controlled by the aft switch. Wiring from the tank No. 2L and 2R switches is routed through conduit to terminal boards on the wing front beam next to the tank No. 2L and 2R fueling valves.

2. Equipment and Materials

O-ring (Ref. Fig. 401 and 402)

String (approximately 15 feet long) [Ref. Steps 4A(6) and 4C(6)]

3. Referenced Procedures

	6-40-00	Exterior Access Doors and Panels
	12-11-00	Fuel Tank Replenishing
R	12-11-11	Underwing Pressure Fueling - Servicing
	20-24-02	Crimped Contact - Removal and Installation
	28-11-00	Fuel Tanks - Maintenance Practices
	28-22-00	Defueling System - Maintenance Practices
	57-31-01	Cover Plates and Doors Access - Removal and Installation

4. Removal/Installation

A. Removal (Tank No. 2L and 2R Fuel Level Control Switch)

WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF. 28-11-00).

(1) On galley right circuit breaker panel, zone 130, open and tag REFUEL - PWR CONT and REFUEL - ALTN PWR circuit breakers.

(2) Remove wing access cover 532AT or 632AT (Ref. 57-31-01) as applicable.

(3) If necessary, transfer fuel to lower fuel level below fuel level control switch conduit (Ref. 28-22-00).

(4) Open wing leading edge section access door 521HB or 621HB (Ref. 6-40-00).

(5) At conduit termination fitting on forward wing beam, remove wire clamp from connector shell.

NOTE: Do not cut the wires to the switch.

(6) Identify wiring and wire terminal receptacles on terminal board 2821-TB5 or 2821-TB8. Tag and disconnect wires from terminal board (Ref. 20-24-02) and disconnect shield from grounding stud. Tie wiring and shield together, and attach a pull-string approximately 12 feet long. Keep the pull-string tie diameter small enough for passage through the wiring conduit.

(7) Disconnect fuel pipe at precheck inlet port fitting (Ref. Fig. 401).

(8) Back off conduit B-nut at electrical port fitting.

(9) Remove attach screws and washers to separate switch assembly from its support bracket.

(10) Slowly pull wiring and pull-string through conduit and onto wing upper surface with attached switch assembly.

(11) Untie pull-string and secure ends of string at convenient point at each end of conduit.

(12) Remove union installed at electrical wiring port. Retain for reinstallation.

B. Installation (Tank No. 2L or 2R Fuel Level Control Switch)

(1) Verify that the circuit breakers opened in Step 4A(1) are open and tagged.

(2) Install new O-ring on union and route wiring through union. Install union in electrical wiring port (Ref. Fig. 401).

(3) Attach pull-string to wiring, keeping the pull-string tie small enough for passage through the wiring conduit. Carefully pull wiring through conduit and into wing leading edge.

(4) Mount switch on support bracket.

(5) Connect fuel inlet line to the fitting at the precheck fuel inlet port.

(6) Connect electrical conduit B-nut.

(7) Install access cover 532AT or 632AT.

(8) Install clamp on connector shell at conduit termination fitting on forward wing beam.

CR CAUTION: DO NOT SHORTEN SWITCH WIRES TO REMOVE EXCESS
CR LENGTH.

CR (9) Route wiring to termination points at terminal board
CR 2821-TB5 or 2821-TB8. Loop and stow any excess length
CR of switch wires; do not shorten wires to remove excess
CR length. Install crimped contact pins on wires. Insert
CR wires into appropriate terminal board receptacles and
CR attach shield to grounding stud.

(10) Close access door 521HB or 621HB (Ref. 6-40-00).

(11) Remove tags and close circuit breakers opened in Step 4A(1).

(12) Refuel tank No. 2L or 2R (Ref. 12-11-00). During refueling, check fuel level control switch operation by performing primary and secondary fuel shutoff tests.

C. Removal (Tank No. 1 and 3 Fuel Level Control Switches)

WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF. 12-11-00).

(1) On galley right circuit breaker panel, zone 130, open and tag REFUEL - PWR CONT and REFUEL - ALTN PWR circuit breakers.

(2) Remove wing access cover 531AT or 631AT (Ref. 57-31-01), as applicable.

(3) If necessary, transfer fuel to lower fuel level below fuel level control switch conduit (Ref. 28-22-00).

(4) Remove wing trailing edge section access cover 541EB or 641EB (Ref. 6-40-00), as applicable.

(5) At conduit termination fitting on rear wing beam, remove wire clamp connector shell.

NOTE: Do not cut the wires to the switch.

(6) Identify wiring and wire terminal receptacles on terminal boards 2821-TB9 and 2821-TB10 (left wing) or 2821-TB11 and 2821-TB12 (right wing). Tag and disconnect wire and shield terminal pins from terminal boards (Ref. 20-24-02). Tie wires and shields together, and attach a pull-string approximately 15 feet long. Keep the pull-string tie small enough for passage through the switch wire conduit. Tie the opposite end of pull-string at a convenient point.

(7) Disconnect fuel pipes at both fuel level switch precheck inlet port fittings (Ref. Fig. 402).

(8) Disconnect conduit connector at conduit Y-fitting.

(9) Remove attach screws and washers to separate both switch assemblies from the switch support bracket.

(10) Slowly pull wiring and pull-string through conduit and onto wing upper surface with attached switch assemblies.

(11) Untie string and secure at convenient point near end of conduit.

(12) Remove section of conduit between switch being replaced and Y-fitting.

(13) Remove union at electrical wiring port of switch assembly being replaced. Retain union for reinstallation.

D. Installation (Tank No. 1 and 3 Fuel Level Control Switches)

(1) Verify that circuit breakers opened in Step 4C(1) are open and tagged.

(2) Install new O-ring on union, and route wiring through union. Install union in electrical wiring port.

(3) Route wiring through short section of conduit located between electrical port union and conduit Y-fitting. Attach conduit B-nuts at union and Y-fitting.

(4) Attach pull-string to wiring, keeping the tie small enough for passage through the switch wiring conduit. Carefully pull wiring into wing trailing edge section.

(5) Mount both switch assemblies on support bracket.

(6) Take up remaining slack wire and secure nut at conduit Y-fitting.

(7) Connect fuel pipes at precheck inlet ports.

(8) Install access cover 531AT or 631AT (Ref. 57-31-01).

(9) Install clamp on conduit connector shell at rear wing beam.

CAUTION: DO NOT SHORTEN SWITCH WIRES.

(10) Remove pull-string and route wiring to termination points of terminal boards. Install terminal pins on new wiring and shield. Loop and stow excess wiring. Insert wires and shields into appropriate terminal board receptacles (Ref. 20-24-02).

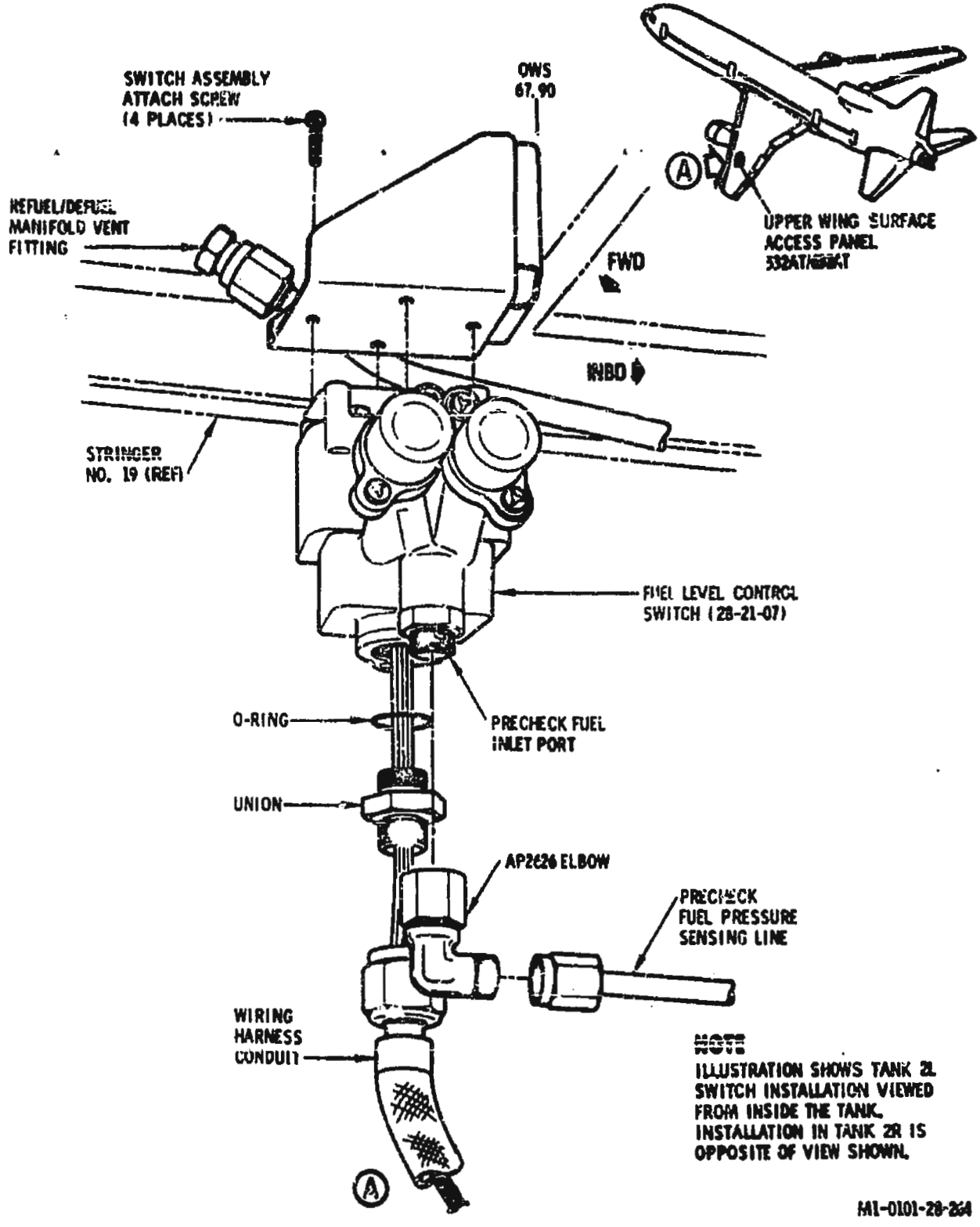
NOTE: The same part number switches are installed in tanks 1, 2L, 2R and 3. Switches were originally manufactured with wires of excess length. Since switches are overhaulable they may be removed and ultimately reinstalled in any tank. To maintain interchangeability of switches, the wires may be shortened when switch is installed in tanks 2L or 2R, but not when installed in tanks 1 or 3 since the distance from switch to terminal block is greater in tanks 2L and 2R.

Excess wire length is permitted in all cases provided the excess is looped and stowed.

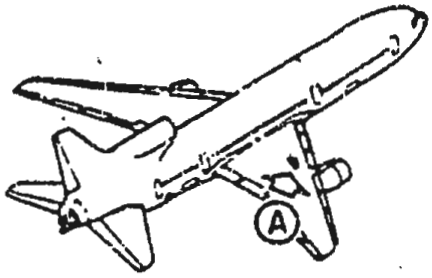
(11) Install access cover 541EB or 641EB (Ref. 6-40-00).

(12) Remove tags and close circuit breakers opened in Step 4C(1).

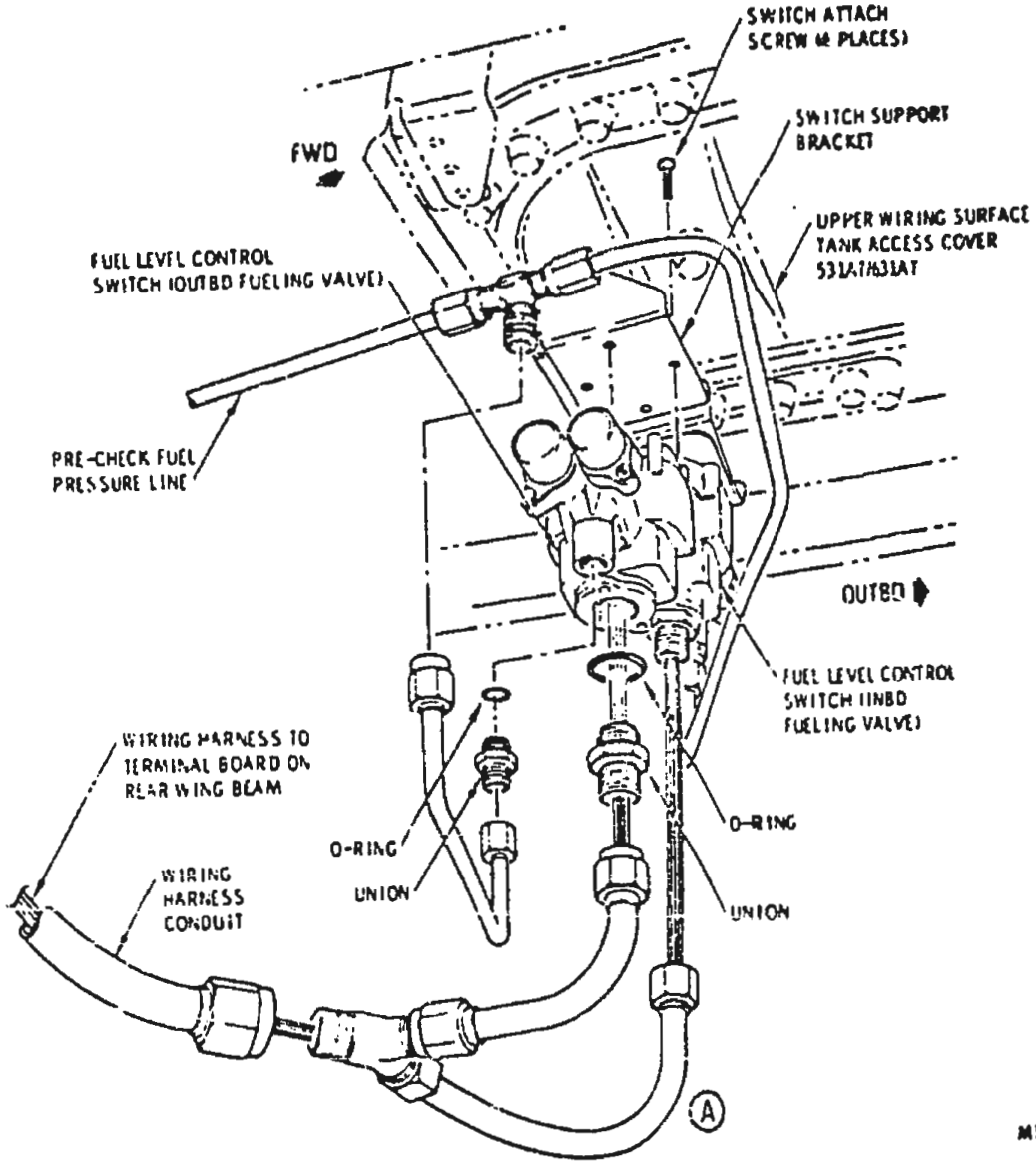
(13) Refuel tank No. 1 or 3 (Ref. 12-11-00). During refueling, check fuel level control switch operation by performing primary and secondary fuel shutoff tests (Ref. 12-11-11).



Tank 2L and 2R Fuel Level Control Switch - Removal and Installation
Figure 401



NOTE
WIRING IS SUPPLIED WITH SUFFICIENT LENGTH TO REACH THE TERMINAL CONNECT POINTS ON THE WING REAR BEAM. PARTIAL DISASSEMBLY OF CONDUIT IS NECESSARY TO PERMIT REMOVAL OF SWITCH AND WITHDRAWAL OF WIRING FROM THE CONDUIT. REMOVE TOTAL LENGTH OF WIRE HARNESS. DO NOT CUT SHORT.



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C Tank 1 and 3 Fuel Level Control Switch - Removal and Installation
C Figure 402

R EFFECTIVITY: ALL
R
001B

TANK 1A/3A FUEL LEVEL CONTROL SWITCH - REMOVAL AND INSTALLATION

1. General

Wing center section tank 1A and 3A fuel level control switches are mounted on removable access panels located on the FS 1103 center section beam. Access to the switch support panels is acquired by entering the forward center section dry bay area.

2. Equipment and Materials

MS29512-8 Gasket

3. Referenced Procedures

6-40-00	Exterior Access Doors and Panels
6-50-00	Interior Access Doors and Removable Panels
12-11-03	Fuel Level Sight Gages - Servicing
12-11-11	Pressure Fueling - Servicing
20-24-02	Crimped Electrical Contact - Removal and Installation
28-11-00	Fuel Tanks - Maintenance Practices
28-21-04	Wiring Diagram Manual
28-22-00	Defueling System - Maintenance Practices

4. Removal/Installation

A. Removal

WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF. 12-11-00 and 28-11-00).

C (1) Defuel the tank (Ref. 28-22-00).

(2) On galley right circuit breaker panel, zone 130, open and tag circuit breakers FUEL SYSTEM - FUELING VALVE TEST and VALVES (17H and 18H).

(3) Open hydraulic service center access door 147AB (Ref. 6-40-00).

(4) On forward wall of hydraulic service center (FS1220) locate terminal board 2899-TB7 (tank 1A) 2899-TB6 (tank 3A) at left or right BL 30 (Ref. Fig. 401).

WARNING: DO NOT CUT THE WIRES TO THE SWITCH.

(5) Identify wiring and wire terminal receptacles on terminal board 2899-TB7 or 2899-TB6. Tag and disconnect wires from terminal board (Ref. 20-24-02) and disconnect shield from grounding stud. Tie wiring and shield together, and attach a pull-string approximately 14 feet long. Keep the pull-string tie diameter small enough for passage through the wiring conduit.

(6) At conduit termination fitting on forward wall remove nut and two washers.

(7) Pry seal out of conduit and remove from wires. Do not damage seal.

(8) Remove nut and washers from wire harness. Retain for reinstallation.

(9) Tie pull-string to structure.

(10) Open access door 142DB.

(11) Remove access panel 141AZ (Ref. 6-50-00).

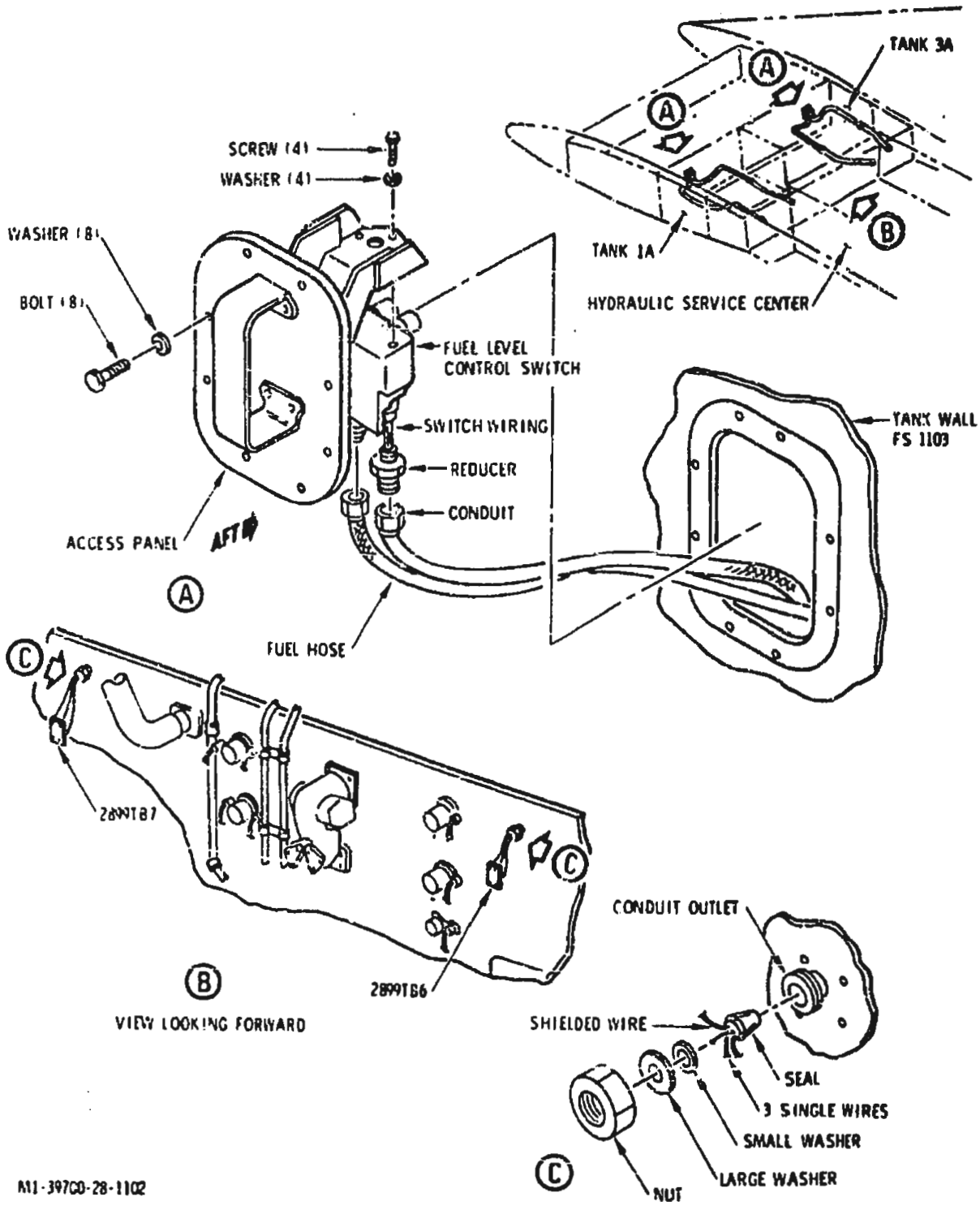
(12) Set up air mover to ventilate center section box area 141.3 and 141.4 (Ref. 28-11-00).

(13) Wear an approved respirator while performing the following steps and have second man standby below access opening.

(14) In zone 141.3 or 141.4 remove bolts from access panel 141.3BZ or 141.4BZ.

(15) Pull panel forward slightly, move it down and tilt top forward to clear top of switch bracket. Pull panel up and out enough to gain access to electrical conduit and fuel hose assembly attached to switch.

CAUTION: BEFORE REMOVING CONDUIT AND HOSE ASSEMBLY FROM FUEL LEVEL SWITCH SECURE THEM TO STRUCTURE TO PREVENT THEIR FALLING BACK INTO TANK.



Fuel Level Control Switch
Figure 401

(16) Secure conduit and hose assembly to structure.

(17) Disconnect fuel hose at precheck inlet port fitting (Ref. Fig. 401).

(18) Back off conduit B-nut at electrical port fitting.

(19) Remove attach screws and washers to separate switch assembly from panel assembly.

(20) Slowly pull wiring and pull-string through conduit with attached switch assembly.

(21) Untie pull-string and secure end of string at convenient point.

(22) Remove reducer installed at electrical wiring port. Retain for reinstallation.

(23) Continue ventilating the area.

B. Installation

(1) Verify that the circuit breakers opened in Step 4A(2) are open and tagged.

(2) Verify that air mover set up in Step 4A(12) is in place and operating.

(3) Wear an approved respirator while performing the following steps.

(4) Install new O-ring on reducer and route wiring through reducer. Install reducer in electrical wiring port (Ref. Fig. 401).

(5) Install fuel level switch on access panel 141.3BZ or 141.4BZ.

(6) Attach pull-string to wiring, keeping the pull-string tie small enough for passage through the wiring conduit.

(7) In hydraulic service center carefully pull wiring through conduit.

(8) Connect fuel inlet line to the fitting at the precheck fuel inlet port.

(9) Connect electrical conduit B-nut.

(10) Carefully slide switch into tank while man in hydraulic service center pulls slack out of wires.

(11) Install access panel 141.3BZ or 141.4BZ.

(12) Purge the area of all fuel fumes (Ref. 28-11-00).

NOTE: Respirator is no longer required.

(13) In hydraulic service center install seal on wires. Shielded triple wires must be placed in largest seal hole.

(14) Push seal into place in conduit outlet.

(15) Install small washer, large washer, and nut over wires and on conduit outlet.

CAUTION: DO NOT SHORTEN THE SWITCH WIRES.

(16) Route wiring to termination points at terminal board 2899-TB7 or 2899-TB6. Install crimped contact pins on wires (Ref. 20-24-02). Loop and stow excess wire. Insert wires into appropriate terminal board receptacles and attach shield to grounding stud (Ref. DM28-21-04).

(17) Remove tags and close circuit breakers opened in Step 4A(2).

(18) Fill tank No. 1A or 3A (Ref. 12-11-11). During fueling, check fuel level control switch operation by performing primary and secondary fuel shutoff tests.

(19) When tank is full check for leaks around access panel 141.3BZ or 141.4BZ.

(20) When purging is completed remove air mover and close access panel 141AZ.

(21) Close access doors 142DB and 147AB.

TANKS 2L, 1, 3, AND 2R FUELING VALVE PLUG-IN ELEMENT REMOVAL AND INSTALLATION

1. Equipment and Materials

Hand-held container

Pre-formed packing (for drain plug)

Pre-formed packing (for plug-in element)

Lock-wire, Fed Spec QQ-W-390, 0.032-inch diameter, or equivalent

Grease, Flourosilicone, Dow Corning FS 1291, or equivalent

C Lubricant petrolatum VVP236

2. Referenced Procedures

12-11-11 Pressure Fueling - Servicing

3. Removal/Installation

A. Removal

(1) On galley right circuit breaker panel, zone 130, open and tag circuit breaker FUEL SYSTEM - FUELING VALVES (H18) and FUELING VALVE TEST (H17).

(2) Gain access to the plug-in element for tank No. 2L or 2R fueling shutoff valve through access door 521HB or 621HB, respectively.

Gain access to the plug-in elements for tank No. 1 or No. 3 fueling shutoff valves through access door 541EB or 641EB, respectively.

(3) Disconnect electrical connector.

(4) Loosen drain plug approximately 1/8 inch and drain fuel (about 2 cups) from valve (Ref. Fig. 401).

(5) When fuel stops draining, remove drain plug and release handle, then reinstall drain plug.

CAUTION: FAILURE TO REINSTALL DRAIN PLUG WILL ALLOW FUEL TO SPILL FROM DRAIN HOLE DURING ROTATION OF THE PLUG-IN ELEMENT TO ITS REMOVAL POSITION.

R FULLY ROTATE THE PLUG-IN-ELEMENT 90 DEGREES COUNTER-CLOCKWISE TO THE UNLATCHED POSITION BEFORE DRAINING FUEL AND PULLING THE ELEMENT OUT OF THE VALVE HOUSING.

(6) Using handle, rotate plug-in element 90 degrees counterclockwise.

(7) Loosen drain plug and drain fuel from valve.

WARNING: C APPROXIMATELY ONE CUP OF FUEL WILL DRAIN FROM TANK 2L AND 3 VALVE HOUSINGS AS PLUG-IN ELEMENT IS C PULLED FROM VALVE HOUSING IN TANKS NO. 3 AND 2L.

(8) When fuel stops draining, pull plug-in element out of valve body.

B. Installation

NOTE: Fueling valve plug-in elements are retained in the aircraft by a bayonet fitting at the base of the fueling valve housing. There is only one correct position for inserting the plug-in element because the bayonet fitting is keyed to achieve correct fuel flow direction through the valve. Figure 401 shows the plug-in elements correctly oriented for insertion into the housing and clockwise rotation to the valve locked position. The bayonet pins or the socket can be damaged by improper installation or removal techniques or by excessive force. Damage to the bayonet can cause the SOV to pop out of the housing resulting in a significant and hazardous spillage of fuel.

C (1) Lubricate new valve body packing with petrolatum and install on plug-in element (Ref. Fig. 401).

CAUTION: PLUG-IN ELEMENT MUST BE ORIENTED IN THE UNLATCHED 90 DEGREE COUNTER-CLOCKWISE POSITION BEFORE IT IS PUSHED INTO THE VALVE HOUSING (REF. FIG. 401).

R (2) On tank 1 or 2R fueling valves,
R orient plug-in element so that handle axis is
R horizontal and handle hinges downward.

R (2) On tank 3 or 2L fueling valves,
R orient plug-in element so that handle axis is
R horizontal and handle hinges upward.

R (3) With plug-in element handle extended and drain plug removed, insert plug-in element into the valve body, using steady, firm pressure, until element is approximately one-quarter inch below wing beam surface.

R (4) Lubricate new drain plug packing with specified grease and install on drain plug.

R (5) Install drain plug in plug-in element (handle must be extended).

CAUTION: BEFORE ROTATING PLUG-IN ELEMENT CLOCKWISE INTO THE LOCKED POSITION, MAKE SURE IT IS PUSHED FULLY INTO THE HOUSING.

R (6) Rotate plug-in element 90 degrees clockwise. (Handle must be aligned between the two valve housing bolt heads that are 60 degrees apart.)

R (7) Loosen drain plug and drain fuel from valve. Remove drain plug when fuel stops draining.

R (8) Rotate handle to its stowed position and install drain plug through hole in handle.

NOTE: Handle should point toward direction of flow which in all cases is outboard.

R (9) Tighten drain plug to a torque of 8 (±0.5) lb-ft.

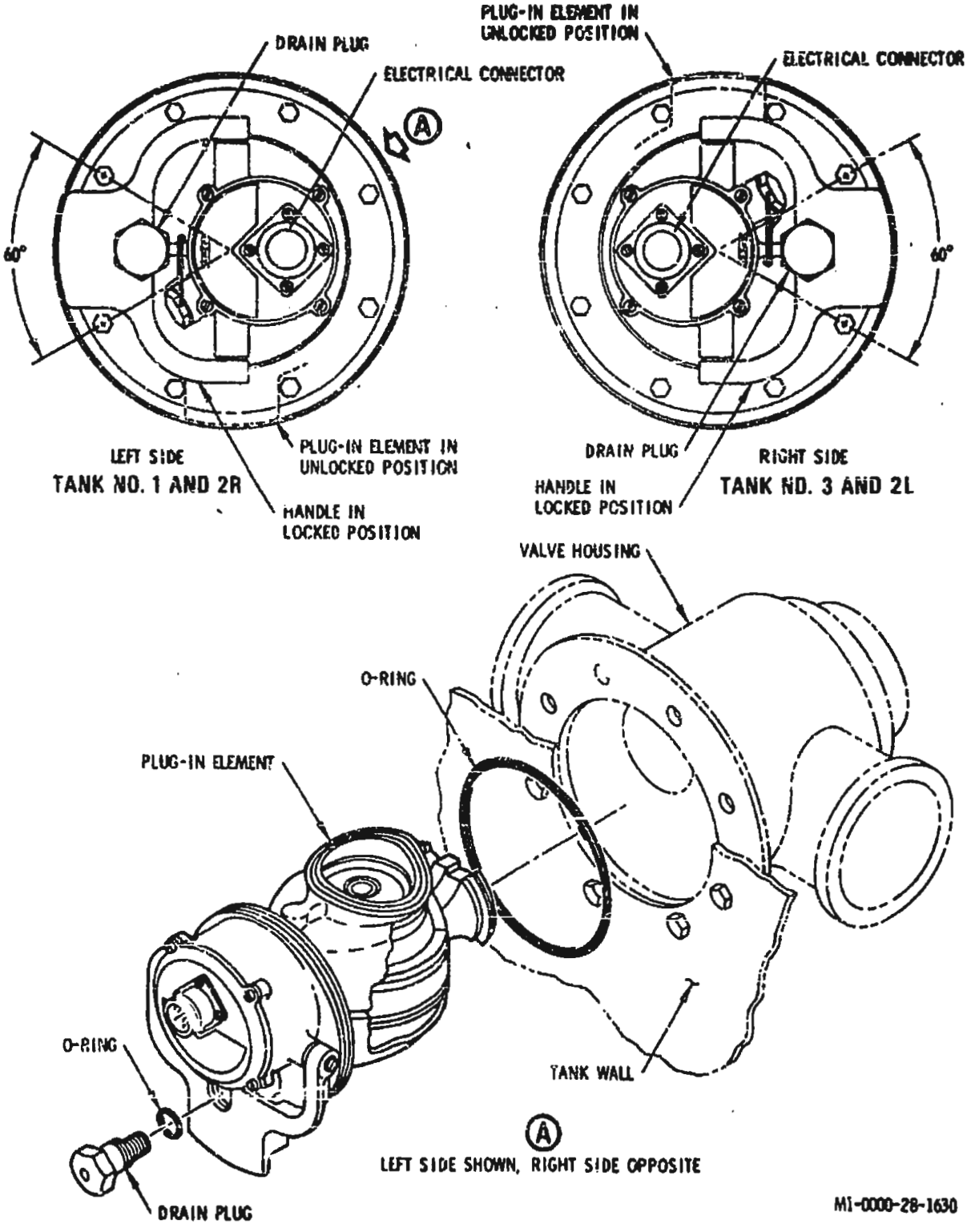
R (10) Wipe up any spilled fuel.

R (11) Connect electrical harness plug. Install lock-wire.

R (12) Remove tag and close circuit breaker opened in Step 3A(1).

R (13) Check operation of replaced plug-in element by fueling the applicable fuel tank (Ref. 12-11-11). Check for fuel leaks at valve.

R (14) Close access door opened in Step 3A(2).



C Tank 2L, 1, 3, 2R Fueling Valve Plug-in Element
C Removal and Installation
C Figure 401

R EFFECTIVITY: ALL
R
001B

TANKS 1A AND 3A FUELING VALVE PLUG-IN ELEMENT REMOVAL AND INSTALLATION

1. Equipment and Materials

Hand-held container

Pre-formed packing (for drain plug)

Pre-formed packing (for plug-in element)

Lock-wire, Fed Spec QQ-W-390, 0.032-inch diameter, or equivalent

Grease, Flourcsilicone, Dow Corning FS 1291, or equivalent

2. Referenced Procedures

12-11-11	Pressure Fueling - Servicing
32-33-00	Main Landing Gear Inboard Door - Maintenance Practices

3. Removal/Installation

A. Removal

R (1) On galley right circuit breaker panel, zone 130, open
R and tag circuit breaker FUEL SYSTEM - FUELING VALVES (H18) and FUELING VALVE TEST (H17).

(2) Locate applicable tank 1A or 3A fueling valve on center section aft beam in left or right main landing gear wheel well (Ref. Fig. 401).

(3) Disconnect electrical connector.

(4) Loosen drain plug approximately 1/8 inch and drain fuel (about 2 cups) from valve.

(5) When fuel stops draining, remove drain plug and release handle, then reinstall drain plug.

R CAUTION: FAILURE TO REINSTALL DRAIN PLUG WILL ALLOW FUEL TO SPILL FROM DRAIN HOLE DURING ROTATION OF THE PLUG-IN ELEMENT TO ITS REMOVAL POSITION.

FULLY ROTATE THE PLUG-IN ELEMENT 90 DEGREES COUNTER-CLOCKWISE TO THE UNLATCHED POSITION BEFORE DRAINING FUEL AND PULLING THE ELEMENT OUT OF THE VALVE HOUSING.

(6) Using handle, rotate plug-in element 90 degrees counterclockwise.

(7) Loosen drain plug and drain fuel from valve.

WARNING: APPROXIMATELY ONE CUP OF FUEL WILL DRAIN FROM THE TANK 3A VALVE HOUSINGS AS PLUG-IN ELEMENT IS REMOVED.

(8) When fuel stops draining, pull plug-in element out of valve body.

B. Installation

NOTE: Fueling valve plug-in elements are retained in the aircraft by a bayonet fitting at the base of the fueling valve housing. There is only one correct position for inserting the plug-in element because the bayonet fitting is keyed to achieve correct fuel flow direction through the valve. Figures 401 and 402 show the plug-in elements correctly oriented for insertion into the housing and clockwise rotation to the valve locked position. The bayonet pins or the socket can be damaged by improper installation or removal techniques or by excessive force. Damage to the bayonet can cause the SOV to pop out of the housing resulting in a significant and hazardous spillage of fuel.

(1) Lubricate new valve body packing with specified grease and install on plug-in element (Ref. Fig. 401 and 402).

CAUTION: PLUG-IN ELEMENT MUST BE ORIENTED IN THE UNLATCHED 90-DEGREE COUNTER-CLOCKWISE POSITION BEFORE IT IS PUSHED INTO THE VALVE HOUSING (REF. FIG. 401 AND 402).

R (2) On tank 1A fueling valve,
R orient plug-in element so that handle axis is
R horizontal and handle hinges downward.

R (2) On tank 3A fueling valve, orient plug-in element so that handle axis is horizontal and handle hinges upward.

R (3) With plug-in element handle extended and drain plug removed, insert plug-in element into the valve body using steady, firm pressure, until element is approximately one-quarter inch below wing beam surface.

R (4) Lubricate new drain plug packing with specified grease and install on drain plug.

R (5) Install drain plug in plug-in element (handle must be extended).

CAUTION: BEFORE ROTATING PLUG-IN ELEMENT CLOCKWISE INTO THE LOCKED POSITION, MAKE SURE IT IS PUSHED FULLY INTO THE HOUSING.

R (6) Rotate plug-in element 90 degrees clockwise. (Handle must be aligned between the two valve housing bolt heads that are 60 degrees apart.)

R (7) Loosen drain plug and drain fuel from valve. Remove drain plug when fuel stops draining.

R (8) Rotate handle to its stowed position and install drain plug through hole in handle.

R (9) Tighten drain plug to a torque of 8 (±0.5) lb-ft.

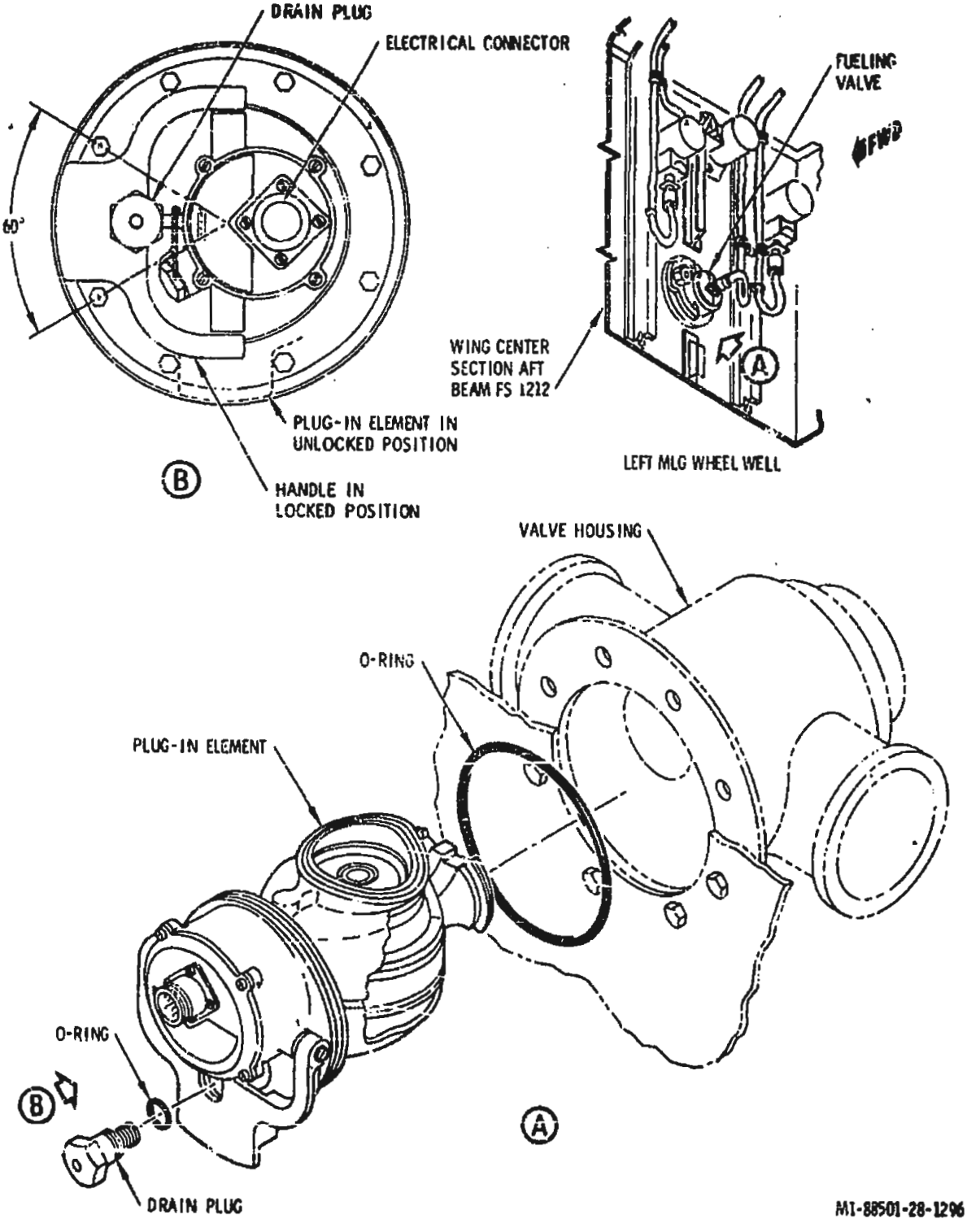
R (10) Wipe up any spilled fuel.

R (11) Connect electrical harness plug. Install lock-wire.

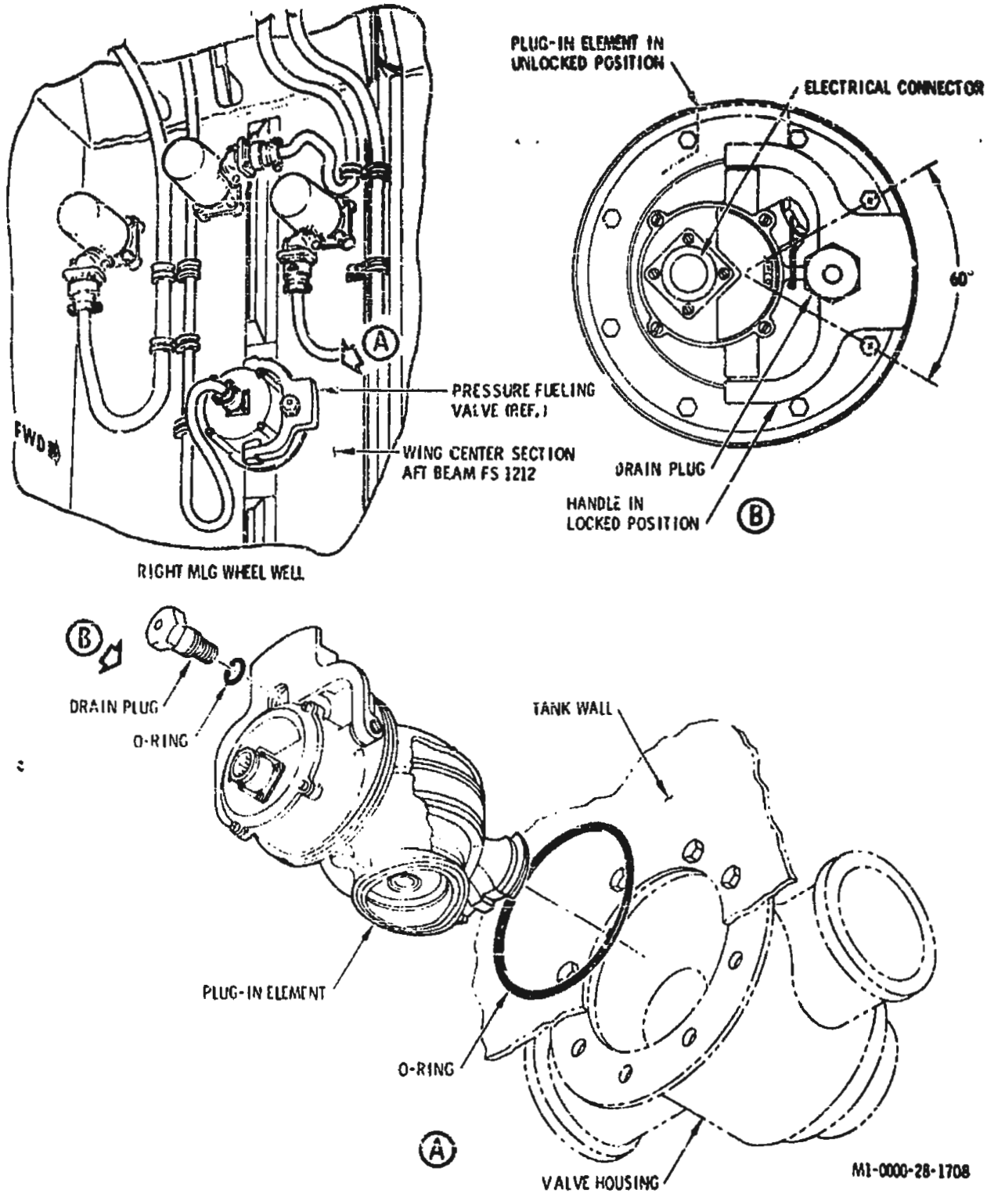
R (12) Remove tag and close circuit breaker opened in Step 3A(1).

R (13) Check operation of replaced plug-in element by fueling the applicable fuel tank (Ref. 12-11-11). Check for fuel leaks at valve.

R (14) Close access door opened in Step 3A(2).



R Tank 1A Fueling Valve Plug-in Element
R Removal and Installation
R Figure 401



R Tank 3A Fueling Valve Plug-in Element
R Removal and Installation
R Figure 402

R FUELING SHUTOFF VALVE HOUSING - REMOVAL AND INSTALLATION

R 1. Equipment and Materials

R Methyl Ethyl Ketone (MEK), Fed Spec TT-M261, or equivalent

R Sealant, LCM40-2121 B12, or equivalent

R Sealant, LCM40-2180 type 1, or equivalent

R O-ring, MS29513-258, or equivalent

R O-ring, MS29513-330, or equivalent

R O-ring, AS113-29-155, or equivalent

R 2. Referenced Procedures

R	6-40-00	Exterior Access Doors and Panels
R	12-11-00	Fuel System Replenishing
R	28-11-00	Fuel Tanks - Maintenance Practices
R	28-20-01	WIG-O-FLEX Couplings - Maintenance Practices
R R	28-21-10	Tanks 2L, 1, 3, and 2R Fueling Valve Plug-in Element - Removal and Installation
R R	28-21-11	Tanks 1A and 3A Plug-in Element - Removal and Installation
R	28-22-00	Defueling - Maintenance Practices
R	28-27-00	Fuel Transfer System
R R	57-33-01	Outer Wing Box, Lower Access Doors - Removal and Installation
R R	57-33-03	Center Section Fuel Tanks, Access Doors - Removal and Installation

R 3. Removal and Installation

R A. Removal

R WARNING: VERIFY THAT AIRCRAFT AND EQUIPMENT USED IN FUEL
R SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE
R STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED
R PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF.
R 12-11-00 AND 28-11-00).

R (1) Defuel applicable tank (Ref. 28-22-00) or transfer fuel
R to another tank (Ref. 23-27-00).

R CAUTION: PLACE FUELING/DEFUELING PANEL SYSTEM POWER SWITCH TO
R OFF POSITION AND ATTACH MAINTENANCE-IN-PROGRESS TAG.

R (2) On galley right circuit breaker panel, zone 130, open
R and tag circuit breakers FUEL SYSTEM - FUELING VALVE
R TEST (H17) and FUELING VALVES (H18).

R (3) Gain access to fueling shutoff valve (Ref. Fig. 401).

R (a) For access to tank No. 2L or 2R fueling shutoff
R valve, remove access door 521HB or 621HB,
R respectively (Ref. 6-40-00).

R (b) For access to tank No. 1 or 3 fueling shutoff
R valve, remove access door 541EB or 641EB,
R respectively (Ref. 6-40-00).

R (c) On aircraft 025,
R fueling shutoff valves for tanks 1A and 3A are
R located on center section aft beam in left and
R right main landing gear wheel well, respectively.

R (4) Remove plug-in element from affected fueling shutoff
R valve housing (Ref. 28-21-10, 28-21-11).

R WARNING: FUEL TANKS CONTAIN EXPLOSIVE VAPOR. THEREFORE,
R OBSERVE ALL APPLICABLE SAFETY REQUIREMENTS AS
R SPECIFIED IN 28-11-00.

R (5) Gain access to fueling shutoff valve housing from
R inside of tank.

R (a) For access to tank 2L or 2R fueling shutoff valve
R housing, remove tank lower access door 532EB or
R 632EB, respectively (Ref. 6-40-00, 57-33-01) and
R purge tank (Ref. 28-11-00).

R (b) For access to tank 1 or 3 fueling shutoff valve
R housing, remove tank lower access door 531EB or
R 631EB, respectively (Ref. 6-40-00, 57-33-01) and
R purge tank (Ref. 28-11-00).

(c) On aircraft 025, for access to tank 1A or 3A fueling shutoff valve housing, enter hydraulic service center through access door 147AB (Ref. 6-40-00). Remove tank access door 147BZ or 147AZ for access to tank 1A or 3A, respectively (Ref. 57-33-03), and purge tank (Ref. 28-11-00).

WARNING: BEFORE ENTERING FUEL TANKS, VERIFY THAT ADEQUATE FLOW OF VENTILATING AIR IS BEING SUPPLIED TO THE TANK (REF. 28-11-00).

(6) Enter tank and disassemble wiggins couplings attaching fuel lines to fueling shutoff valve housing (Ref. 28-20-01).

(7) From outside of tank, remove eight mounting bolts and washers attaching fueling shutoff valve housing to inside of tank.

(8) Remove fueling shutoff valve housing from inside of tank.

NOTE: Gently tap fueling shutoff valve housing with rubber mallet to aid in loosening sealing compound.

(9) Clean mating surfaces of tank, new fueling shutoff valve housing and mounting bolts and washers with methyl ethyl keytone or equivalent.

B. Installation

(1) Install O-ring in groove on flange area of fueling shutoff valve housing (Ref. Fig. 401).

(2) Apply LCM40-2121 B12 sealant to bolts and washers.

(3) Position fueling shutoff valve housing over mounting holes and install bolts and washers.

(4) Inside tank, apply continuous coat of LCM 40-2180 type I sealant to fillet area of fueling shutoff valve housing and smooth with phenolic tool.

(5) Assemble Wiggins couplings attaching fuel lines to fueling shutoff valve housing and lockwire (Ref. 28-20-01).

(6) Install tank access covers.

(7) Install plug-in element (Ref. 28-21-10, 28-21-11).

R (8) Allow sealants to cure for times specified (Ref. R PB75-424D).

R (a) LCM 40-2121 B12

R 2 days over 65 degrees fahrenheit plus 6 hours R over 115 degrees fahrenheit.

R 16 hours over 115 degrees fahrenheit.

R A minimum of 5 days over 65 degrees fahrenheit.

R (b) LCM 40-2180 TYPE 1

R Standard cure; 75 (plus or minus 10) degrees R fahrenheit for .5 hours.

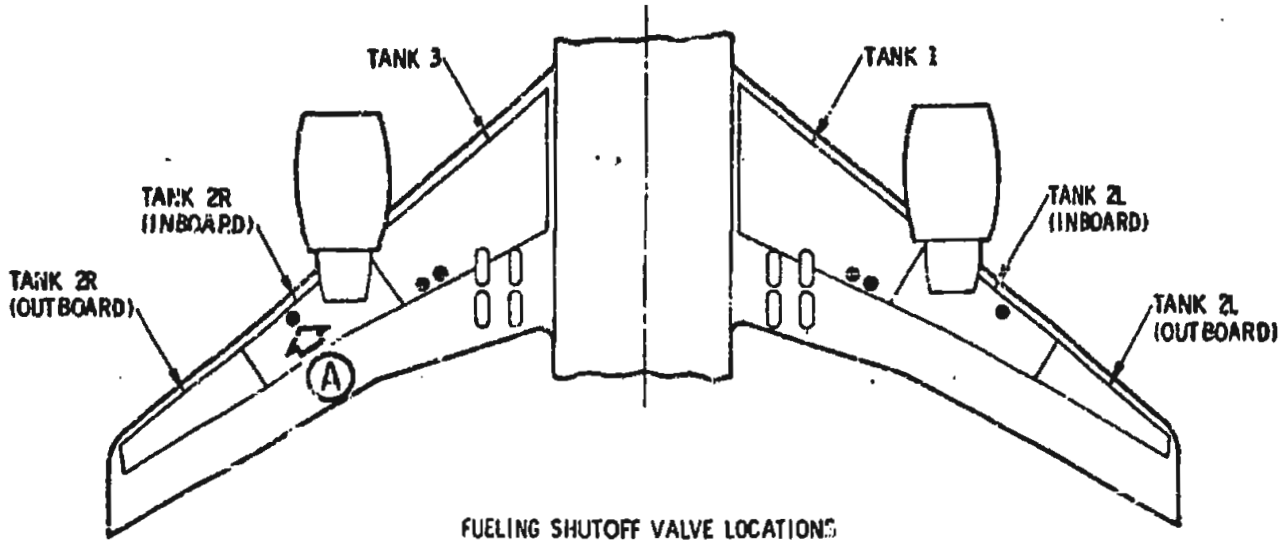
R 125 (plus or minus 10) degrees fahrenheit for 3 R hours.

R (9) Remove tags and close circuit breakers opened in Step R 3A(2).

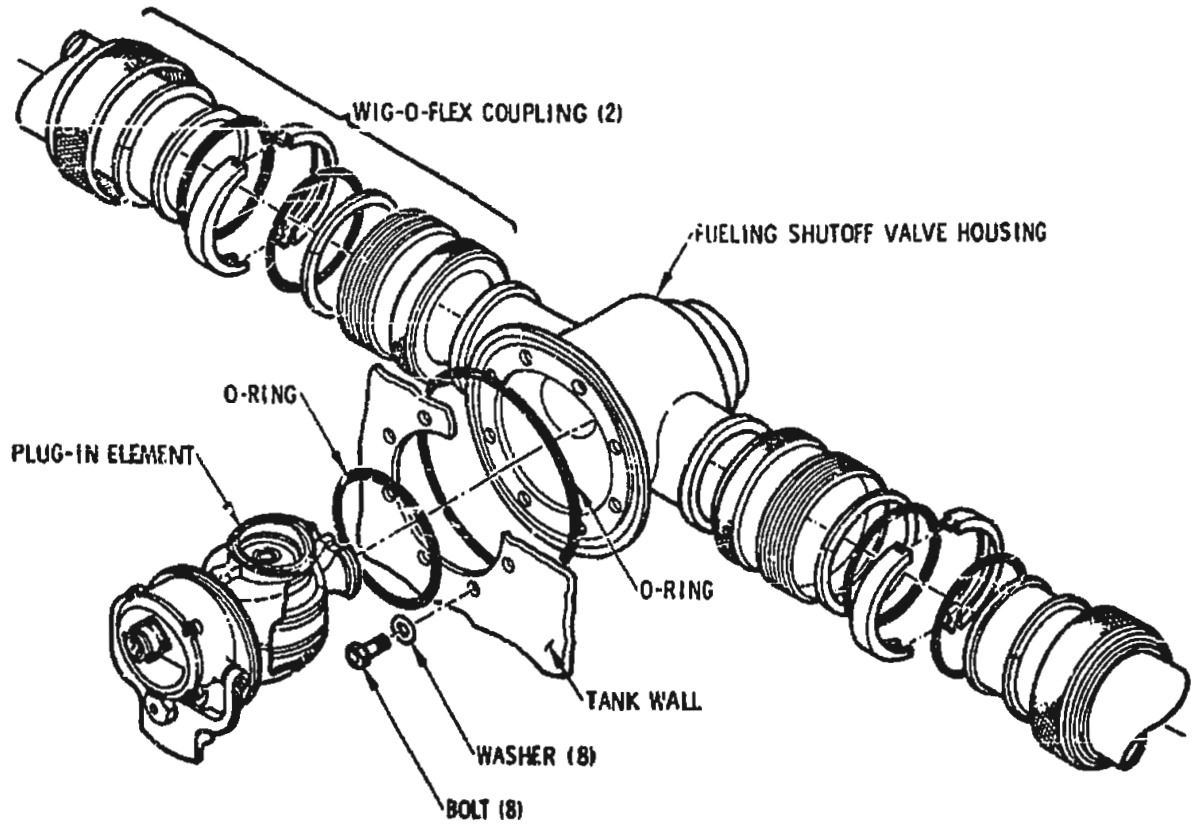
R (10) Fuel tank and check for fuel leaks around fueling R shutoff valve (Ref. 12-11-00).

R (11) Install access covers removed in Step 3A(3), as R applicable.

R (12) Remove MAINTENANCE-IN-PROGRESS tags.



FUELING SHUTOFF VALVE LOCATIONS

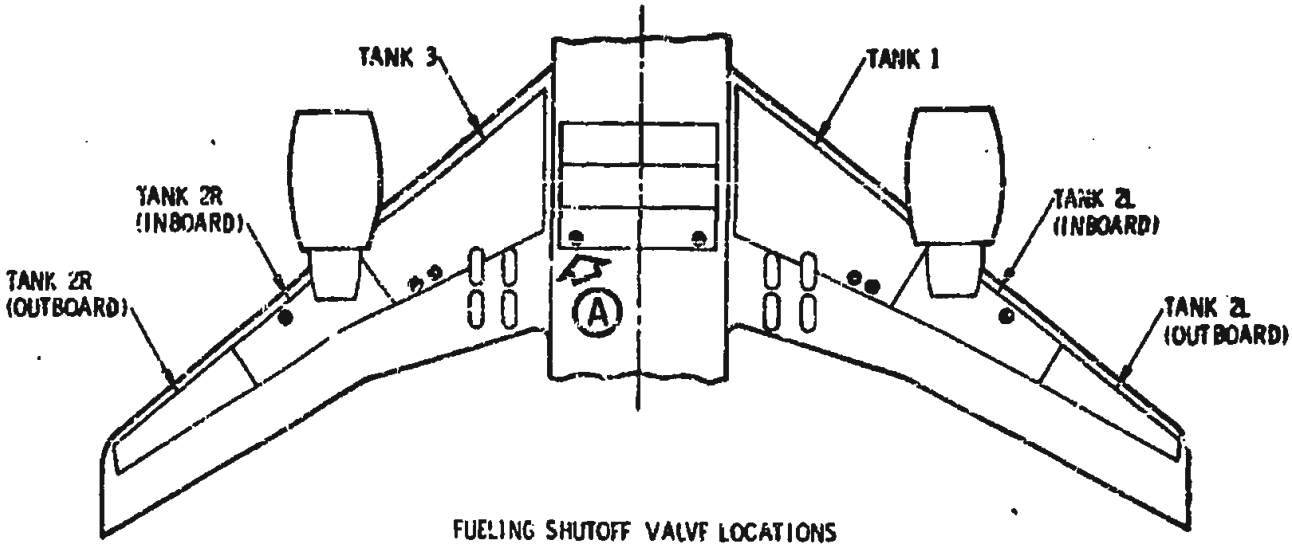


A

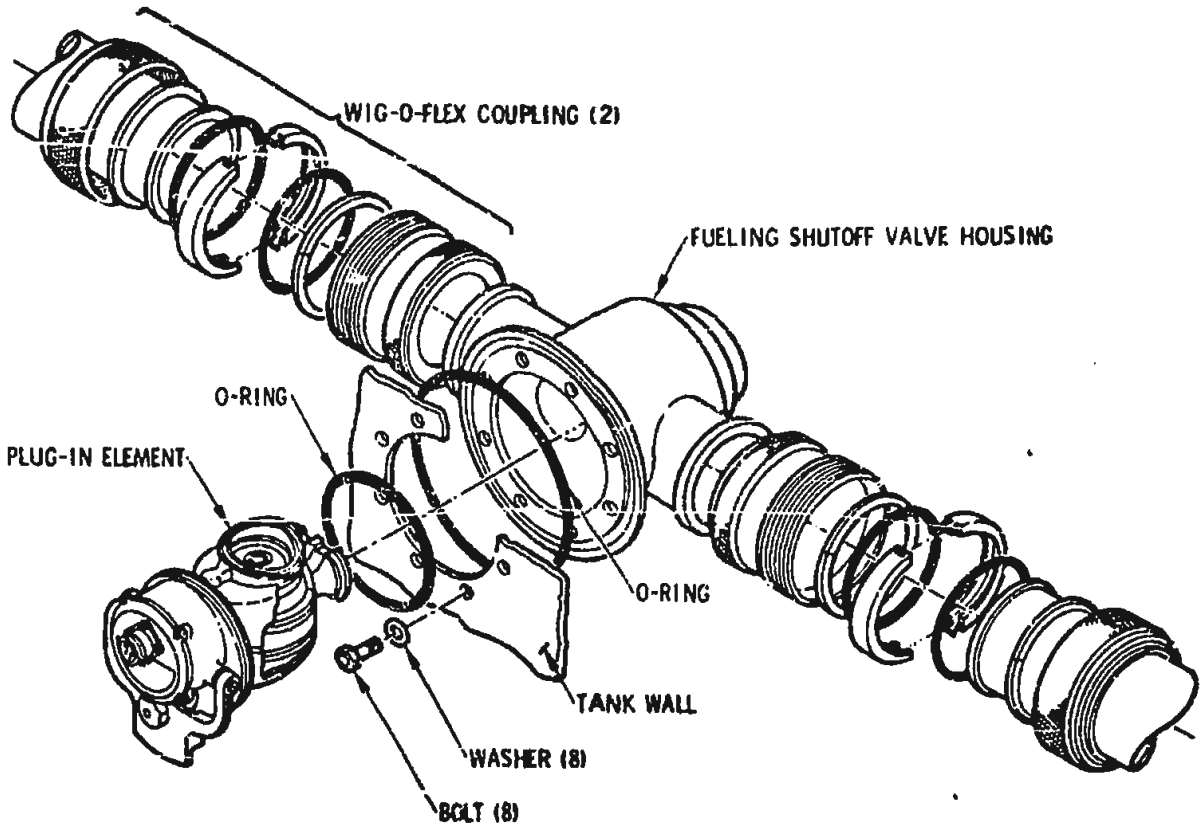
FUELING SHUTOFF VALVE
(TYPICAL 6 PLACES)

M1-0000-28-1628

R Fueling Shutoff Valve Housing
R Removal and Installation
R Figure 401



FUELING SHUTOFF VALVE LOCATIONS



A

FUELING SHUTOFF VALVE (TYPICAL 8 PLACES)

M1-0000-28-1629

R Fueling Shutoff Valve Housing
R Removal and Installation
R Figure 401

R # FUELING/DEFUELING PANEL - REMOVAL AND INSTALLATION

1. Equipment and Materials

Lock-wire, Fed Spec QQ-W-390, 0.032-inch diameter, or equivalent

2. Referenced Procedures

R 28-21-99 Fueling/Defueling Panel - Adjustment and Test

3. Removal/Installation

A. Removal

(1) On the galley right circuit breaker panel, zone 131, open and tag the following FUEL SYSTEM circuit breakers

R REFUELING CONTROL PWR (16H)

R FUELING VALVE TEST (17H)

R FUELING VALVES (18H)

R REFUEL PWR CONT (19H)

R REFUEL ALTN POWER (20G)

R FUEL SYS GA RPTR IND (A15)

R (2) At fueling/defueling panel, zone 621, disconnect three wiring harness plugs at inboard side of panel assembly.

(3) Remove panel assembly attach bolts and washers and lower panel out of its installed position.

B. Installation

(1) Secure the panel in its installed position using attach washers and bolts.

(2) Connect three wiring harness plugs at inboard side of panel assembly. Safety harness plugs with lock-wire.

(3) Remove tags and close circuit breakers opened in Step 3A(1).

R (4) Perform operational test of fueling/defueling panel (Ref. 28-21-99).

R

FUELING/DEFUELING PANEL - ADJUSTMENT AND TEST

1. Adjustment/Test

The following procedure checks the operation of the control switches and indicators on the fueling/defueling panel.

2. Referenced Procedure

24-00-00 Electrical Power - Maintenance Practices

3. Operational Test

CR CAUTION: IF BOOST PUMP CIRCUIT BREAKER TRIPS, DO NOT RESET UNTIL IT IS VERIFIED THAT CIRCUIT BREAKER TRIP IS NOT CAUSED BY MALFUNCTION IN BOOST PUMP ASSEMBLY (Ref. 28-24-00 FAULT ISOLATION PROCEDURES).

A. Fueling/Defueling Panel

(1) Verify that all fuel system circuit breakers on the Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, pilots overhead circuit breaker panel CB1, zone 210, and galley right circuit breaker panel, zone 131, are closed.

(2) Apply aircraft electrical power (Ref. 24-00-00).

(3) In right wing leading edge section, zone 621, verify that all fueling/defueling panel switches are in OFF or CLOSE position and SET POINT index in each fuel quantity indicator is at extreme low end of indicator scale (Ref. Fig. 401).

(4) Hold SYSTEM POWER switch momentarily in ON position. Switch must stay latched in ON postion when released. Verify the following results:

(a) Fuel quantity indicator pointers move upscale to indicate amount of fuel in respective tanks.

(b) All VALVE CLOSED lights come on; all other lights are off.

NOTE: If ISOLATION VALVE or DEFUEL VALVE light is on, check override lever on respective valve for CLOSED position before suspecting a fault in the panel assembly.

(5) Hold LIGHTS switch in TEST position. All panel lights that are not on must come on.

(6) Release LIGHTS switch. All lights that came on in preceding step must go out.

(7) Using fuel quantity indicator SET knobs, adjust SET POINT indexes at a point higher than the indicator pointer. SET POINT TEST lights must come on.

(8) Hold GAUGES switch in TEST position. All fuel quantity indicator pointers must drive upscale. Respective SET POINT TEST lights must go out.

(9) Release GAUGES switch. All indicator pointers must return to previous position and respective SET POINT TEST light must come back on.

(10) Place ISOLATION VALVE switch in OPEN position. ISOLATION VALVE in-transit light must come on and then go out as valve opens.

(11) Turn on all eight fuel boost pumps.

(12) With all boost pumps running, check operation of each float actuated fuel level control switch assembly as directed in Steps 13 through 20.

(13) Place tank 1 DEFUEL VALVE and tank 2L FUELING VALVE switches to OPEN position. Tank 1 DEFUEL VALVE light must come on and then go off. Tank 2L FUELING VALVE CLOSED light must go off. Verify transfer of fuel from tank 1 to tank 2L by observing rise in tank 2L fuel quantity pointer. If fuel quantity indicator pointer approaches the SET POINT index, set the index to a higher value.

(14) Hold FUEL SHUTOFF TEST switch in PRI position until tank 2L VALVE CLOSED light comes on. Verify that transfer of fuel to tank 2L terminates.

(15) Release FUEL SHUTOFF TEST switch. When 2L VALVE CLOSED light goes out, verify that transfer of fuel is restored.

(16) Repeat preceding Steps (14) and (15) with FUEL SHUTOFF TEST switch held in SEC position.

(17) Close tank 1 DEFUEL VALVE and tank 2L FUELING VALVE switches. The DEFUEL VALVE light must come on and then go out. The FUELING VALVE CLOSED light must come on and transfer of fuel to tank 2L must terminate.

(18) Place tank 2L DEFUEL VALVE and tank 1 FUELING VALVE switches in OPEN position. Observe transfer of fuel from tank 2L to tank 1 and check operation of PRI and SEC FUEL SHUTOFF TEST switch positions as in preceding Steps (13) through (17).

(19) Using procedure in preceding Steps (13) through (18) and applicable DEFUEL and FUELING VALVE switches, check operation of respective tank defuel and fueling valve control circuits by transferring fuel between following tanks:

NOTE: Check each of the two fueling valves in Tank 1 and 3 individually. Verify that the fuel indicator shows fuel entering only the tank having the open valve.

(a) Tank 1 to tank 3

(b) Tank 2L to tank 1

(c) Tank 3 to 2R

(d) Tank 3 to tank 1

(e) Tank 2R to 3

(20) On aircraft with tanks 1A and 3A transfer fuel from tank 1 to tank 1A, and tank 3 to tank 3A, to check operation of respective tank fueling valve control circuit (Ref. Step (13) through (17).

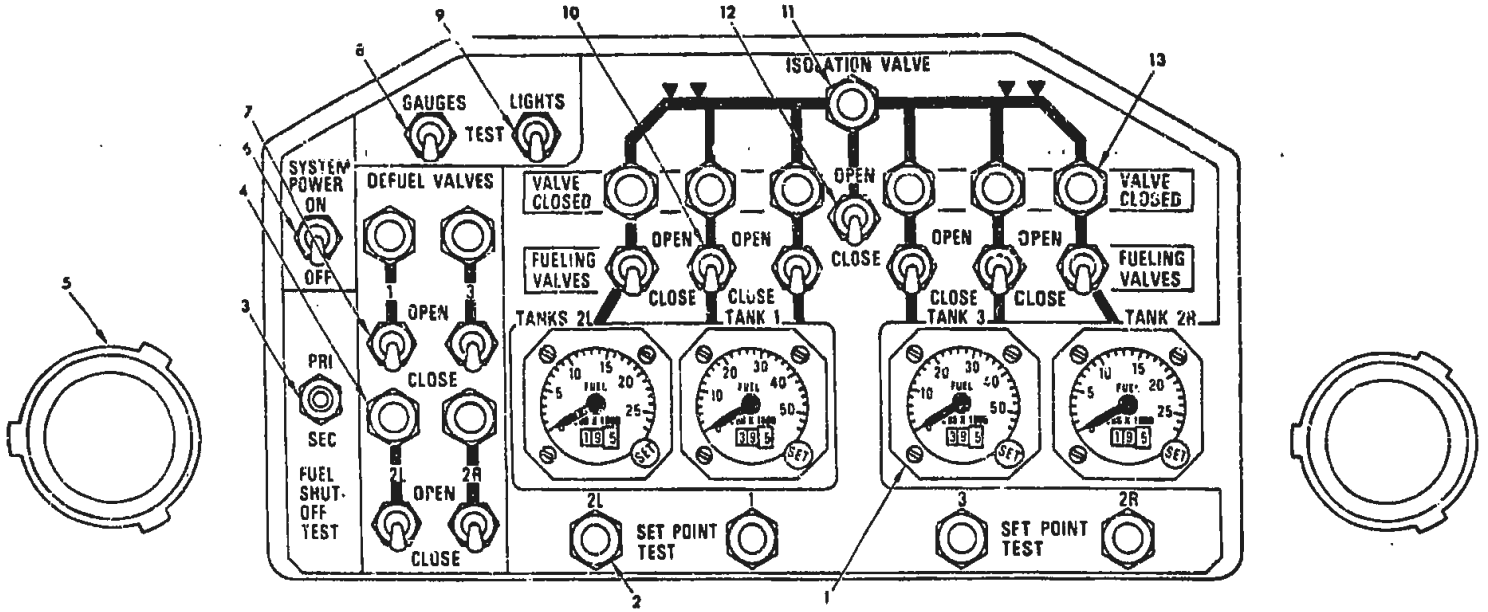
(21) Place ISOLATION VALVE switch to CLOSE position. Verify valve in-transit light blinks on, then goes out.

(22) Turn off fuel boost pumps.

(23) On FE/SO FUEL SYSTEM panel, zone 215, depress and then release REFUEL POWER switchlight. The switchlight ON light must go out. At the fueling/defueling panel, the SYSTEM POWER switch must release to the OFF position and all lights on the panel must go out.

(24) Remove electrical power (Ref. 24-00-00).

(25) Close the fueling/defueling panel access door.



1 FUEL QUANTITY INDICATOR (4 PLACES)

- PROVIDES DIGITAL AND ANALOG INDICATION OF FUEL QUANTITY
- INCORPORATES SET POINT INDEX TO PERMIT SELECTION OF DESIRED FUEL QUANTITY. REFUELING IS AUTOMATICALLY TERMINATED WHEN INDICATOR POINTER REACHES INDEX SETTING. TERMINATION OF FUEL FLOW INTO TANK IS INDICATED WHEN CORRESPONDING SET POINT TEST LIGHT GOES OUT AND VALVE CLOSED LIGHT(S) COMES ON

2 SET POINT TEST LIGHT (4 PLACES)

- PROVIDES INDICATION OF AUTOMATIC SHUTOFF OF REFUELING FLOW. LIGHT GOES OUT WHEN INDICATOR POINTER PASSES SET POINT INDEX

3 FUEL SHUTOFF TEST SWITCH

- SWITCH IS DOUBLE-POLE DOUBLE-THROW MOMENTARY CONTACT TYPE WITH CENTER OFF POSITION
- PRIMARY AND SECONDARY POSITIONS SIMULATE FULL TANK CONDITION TO TEST AUTOMATIC FUEL SHUTOFF OPERATION. THE TEST VERIFIES OPERATION OF THE PRIMARY AND SECONDARY PILOT VALVES IN THE FUELING VALVES AND PRIMARY AND SECONDARY SWITCHES IN THE CORRESPONDING FUEL LEVEL CONTROL SWITCHES
- PROPER TEST RESULT IS INDICATED BY ALL VALVE CLOSED LIGHTS COMING ON

4 DEFUEL VALVES LIGHT (4 PLACES)

- LIGHT NORMALLY BLINKS ON, THEN OFF, WHEN VALVE IS IN-TRANSIT TO OPEN OR CLOSED POSITION. IF ON STEADY, VALVE IS NOT IN AGREEMENT WITH SWITCH POSITION

5 REFUEL/DEFUELING NOZZLE ADAPTER (2 PLACES)

- INCORPORATES PROVISIONS FOR ATTACHING STANDARD FUEL HOSE NOZZLES. TWO ADAPTERS ALSO LOCATED IN LEFT WING
- NOZZLE ATTACHMENT FLANGE IS DESIGNED TO BREAKAWAY IF PRE-DETERMINED CRITICAL FORCE IS APPLIED TO ADAPTERS THROUGH FUELING HOSES
- BROKEN NOZZLE ATTACHMENT FLANGES CAN BE REPLACED WITHOUT DISASSEMBLY. INTERNAL SPRING LOADED POPPET CLOSES ADAPTER PORT
- TWO REFUEL/DEFUELING NOZZLE ADAPTERS ARE ALSO LOCATED IN LEFT WING LEADING EDGE, ZONE 621 FB

6 SYSTEM POWER SWITCH

- CONTROLS APPLICATION OF ELECTRICAL POWER TO REFUEL/DEFUELING SYSTEM
- WHEN THE SWITCH IS ELECTRICALLY LATCHED IN ON POSITION, SERVICE PANEL LIGHTS COME ON, FUEL QUANTITY INDICATORS ARE POWERED, FUEL SHUTOFF TEST CIRCUIT IS ARMED, VALVE CLOSED INDICATOR LIGHTS COME ON, AND REFUEL POWER SWITCHLIGHT ON FLIGHT ENGINEER/SECOND OFFICERS FUEL SYSTEM PANEL COMES ON
- IF INADVERTENTLY LEFT ON, SYSTEM POWER SWITCH CAN BE UNLATCHED TO OFF POSITION BY DEPRESSING REFUEL POWER SWITCHLIGHT

7 DEFUEL VALVES SWITCH (4 PLACES)

- OPENS OR CLOSES DEFUELING VALVES

8 GAUGES TEST SWITCH

- WHEN HELD IN POSITION, SWITCH CHECKS OPERATION OF FUEL QUANTITY INDICATORS
- ALL FUEL QUANTITY INDICATORS DRIVE FULL UPSCALE
- CORRESPONDING SET POINT LIGHTS GO OUT
- ANY FUELING VALVE THAT IS OPEN WILL CLOSE
- SWITCH OPERATES IN PARALLEL WITH QTY TEST SWITCH ON FLIGHT ENGINEER/SECOND OFFICERS FUEL SYSTEM PANEL

9 INDICATOR LIGHTS TEST SWITCH

- TEST ON PANEL INDICATOR LIGHTS. ANY LIGHT NOT ALREADY ON WILL COME ON WHEN SWITCH IS HELD IN TEST POSITION

10 FUELING VALVE CONTROL SWITCH (6 PLACES)

- ARMS FUELING VALVE CIRCUIT FOR OPEN OPERATION
- FUEL PRESSURE IS REQUIRED TO OPEN FUELING VALVE

11 ISOLATION VALVE LIGHT

- LIGHT NORMALLY BLINKS ON, THEN OFF, WHEN VALVE IS IN-TRANSIT TO OPEN OR CLOSED POSITION. IF ON STEADY, VALVE IS NOT IN AGREEMENT WITH SWITCH POSITION

12 ISOLATION VALVE SWITCH

- OPENS REFUEL/DEFUELING MANIFOLD ISOLATION VALVE TO PERMIT REFUEL/DEFUELING OF ALL TANKS THROUGH ADAPTERS IN ONE WING ONLY
- PERMITS CROSS-SHIP TRANSFER OF FUEL BY MAINTENANCE PERSONNEL

13 FUELING VALVE POSITION LIGHT (6 PLACES)

- LIGHT IS ON WHEN CORRESPONDING FUELING VALVE IS CLOSED

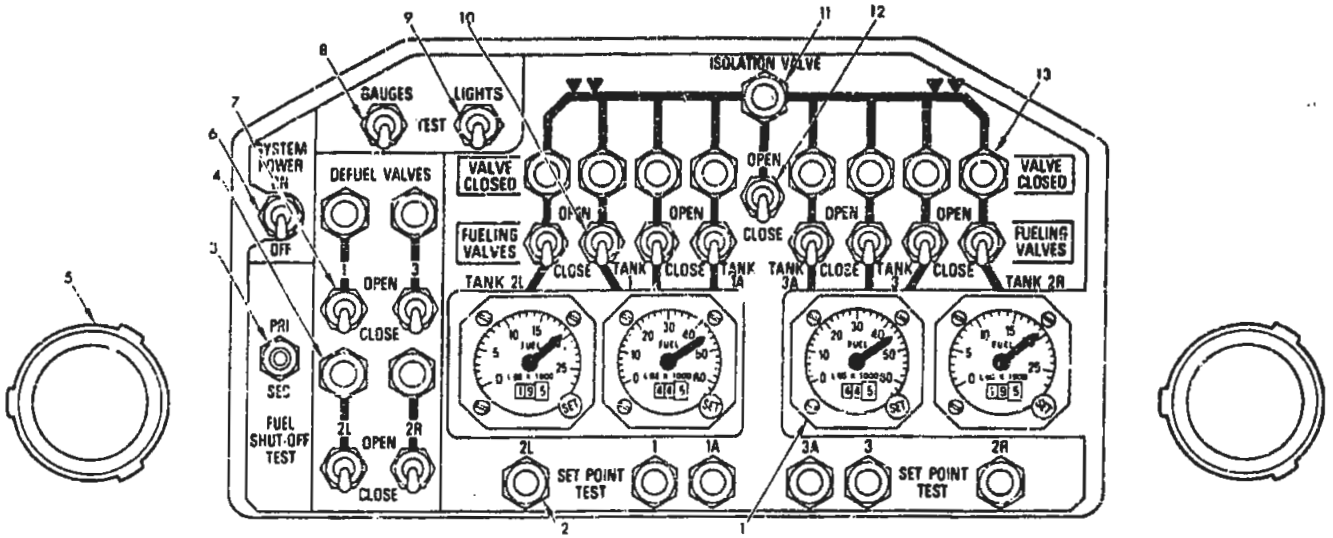
M1-2005-28-160

R
R

Fueling/Defueling Panel
Figure 501

EFFECTIVITY: 001-024, 027

0118



1 FUEL QUANTITY INDICATOR (4 PLACES)

- PROVIDES DIGITAL AND ANALOG INDICATION OF FUEL QUANTITY (REF. 28-41-00).
- INCORPORATES SET POINT INDEX TO PERMIT SELECTION OF DESIRED FUEL QUANTITY. REFUELING IS AUTOMATICALLY TERMINATED WHEN INDICATOR POINTER REACHES INDEX SETTING. TERMINATION OF FUEL FLOW INTO TANK IS INDICATED WHEN CORRESPONDING SET POINT TEST LIGHT GOES OFF AND VALVE CLOSED LIGHT COMES ON (REF. 28-21-00)

2 SET POINT TEST LIGHT (6 PLACES) (REF. 28-21-00)

- PROVIDES INDICATION OF AUTOMATIC SHUTOFF OF FUELING FLOW. LIGHT GOES OFF WHEN INDICATOR POINTER PASSES SET POINT INDEX (REF. 28-21-00)

3 FUEL SHUTOFF TEST SWITCH (REF. 28-21-00)

- SWITCH IS DOUBLE-POLE DOUBLE-THROW MOMENTARY CONTACT TYPE WITH CENTER OFF POSITION
- PRIMARY AND SECONDARY POSITIONS SIMULATE FULL TANK CONDITION TO TEST AUTOMATIC FUEL SHUTOFF OPERATION. THE TEST VERIFIES OPERATION OF THE PRIMARY AND SECONDARY PILOT VALVES IN THE FUELING VALVES AND PRIMARY AND SECONDARY SWITCHES IN THE CORRESPONDING FUEL LEVEL CONTROL SWITCHES
- PROPER TEST RESULT IS INDICATED BY ALL VALVE CLOSED LIGHTS COMING ON

4 DEFUEL VALVES LIGHT (4 PLACES) (REF. 28-22-00)

- LIGHT NORMALLY BLINKS ON, THEN OFF WHEN VALVE IS IN-TRANSIT TO OPEN OR CLOSED POSITION. IF ON STEADY, VALVE IS NOT IN AGREEMENT WITH SWITCH POSITION

5 FUELING/DEFUELING NOZZLE ADAPTER (2 PLACES) (REF. 28-21-00)

- INCORPORATES PROVISIONS FOR ATTACHING STANDARD FUEL HOSE NOZZLES
- NOZZLE ATTACHMENT FLANGE IS DESIGNED TO BREAKAWAY IF PRE-DETERMINED CRITICAL FORCE IS APPLIED TO ADAPTERS THROUGH FUELING HOSES
- BROKEN NOZZLE ATTACHMENT FLANGES CAN BE REPLACED WITHOUT DISASSEMBLY. INTERNAL SPRING LOADED POPPET CLOSES ADAPTER PORT
- TWO FUELING/DEFUELING NOZZLE ADAPTERS ARE ALSO LOCATED IN LEFT WING LEADING EDGE, ZONE 521 FB

6 SYSTEM POWER SWITCH (REF. 28-21-00)

- CONTROLS APPLICATION OF ELECTRICAL POWER TO FUELING/DEFUELING SYSTEM
- WHEN THE SWITCH IS ELECTRICALLY LATCHED IN ON POSITION, SERVICE PANEL LIGHTS COME ON, FUEL QUANTITY INDICATORS ARE POWERED, FUEL SHUTOFF TEST CIRCUIT IS ARMED, VALVE CLOSED INDICATOR LIGHTS COME ON, AND REFUEL POWER SWITCHLIGHT ON FLIGHT ENGINEER/SECOND OFFICERS FUEL SYSTEM PANEL COMES ON
- IF INADVERTENTLY LEFT ON, SYSTEM POWER SWITCH CAN BE UNLATCHED TO OFF POSITION BY DEPRESSING REFUEL POWER SWITCHLIGHT

7 DEFUEL VALVES SWITCH (4 PLACES) (REF. 28-22-00)

- OPENS OR CLOSES DEFUELING VALVES

8 GAUGES TEST SWITCH (REF. 28-41-00)

- WHEN HELD IN POSITION, SWITCH CHECKS OPERATION OF FUEL QUANTITY INDICATORS
- ALL FUEL QUANTITY INDICATORS DRIVE FULL UPSCALE
- CORRESPONDING SET POINT LIGHTS GO OUT
- ANY FUELING VALVE THAT IS OPEN WILL CLOSE
- SWITCH OPERATES IN PARALLEL WITH QUANTITY TEST SWITCH ON FLIGHT ENGINEER/SECOND OFFICERS FUEL SYSTEM PANEL

9 INDICATOR LIGHTS TEST SWITCH (REF. 28-21-00)

- TESTS PANEL INDICATOR LIGHTS. ANY LIGHT NOT ALREADY ON WILL COME ON WHEN SWITCH IS HELD IN TEST POSITION

10 FUELING VALVE CONTROL SWITCH (8 PLACES) (REF. 28-21-00)

- ARMS FUELING VALVE CIRCUIT FOR OPEN OPERATION
- FUEL PRESSURE IS REQUIRED TO OPEN FUELING VALVE

11 ISOLATION VALVE LIGHT (REF. 28-21-00)

- LIGHT NORMALLY BLINKS ON, THEN OFF, WHEN VALVE IS IN-TRANSIT TO OPEN OR CLOSED POSITION. IF ON STEADY, VALVE IS NOT IN AGREEMENT WITH SWITCH POSITION

12 ISOLATION VALVE SWITCH (REF. 28-21-00)

- OPENS FUELING/DEFUELING MANIFOLD ISOLATION VALVE TO PERMIT FUELING/DEFUELING OF ALL TANKS THROUGH ADAPTERS IN ONE WING ONLY
- PERMITS CROSS-SHIP TRANSFER OF FUEL BY MAINTENANCE PERSONNEL

13 FUELING VALVE POSITION LIGHT (8 PLACES) (REF. 28-21-00)

- LIGHT IS ON WHEN CORRESPONDING FUELING VALVE IS CLOSED

M1-25001-28-1036

Fueling/Defueling Panel
Figure 501

DEFUELING SYSTEM - DESCRIPTION AND OPERATION

R 1. General

The defueling system (Ref. Fig. 1) uses portions of the fueling system plumbing and manifolding to defuel the aircraft through the fueling hose adapters in each wing. Components primarily associated with the defueling operation are four defuel valves (one for each tank), defuel valve control switches and valve position lights on the fueling/defueling panel, the electrical system relays controlling valve operation and the aircraft boost pumps. Fuel quantity gages on the fueling/defueling panel are monitored during the operation to determine the quantity of fuel remaining in the aircraft tanks. Cross ship defueling using only left or right wing fueling hose adapters is accomplished by opening the cross ship manifold isolation valve (Ref. 28-21-00). Intertank transfer of fuel is possible by opening appropriate fueling and defueling valves and the manifold isolation valve as required to obtain the desired fuel flows.

The fueling/defueling panel in the right wing, zone 621FB, contains the fuel quantity indicators, defuel valve control switches, and the manifold isolation valve switch used to simultaneously or selectively defuel the tanks or transfer fuel to another tank.

Defueling is accomplished by connecting the hoses from the fuel receiver (fueling station or trucks) to the fuel hose adapters in each wing. With the defuel valves open fuel is withdrawn from the tank through the fuel feed boost pump housings, engine fuel feed lines, and defuel valves into the cross ship fueling/defueling manifold to the fuel hose adapters by the defueling facility pumps. Defueling flow rate is a function of the suction pressure applied at the fueling hose adapters. With four hoses attached, and all tanks being simultaneously defueled, the defueling flow rate, with a suction pressure of 10 psi at the nozzle adapters, is approximately 334 U.S. gallons per minute. This rate is increased to 650 U.S. gallons per minute with the aircraft boost pumps operating.

Tank 1A and 3A center section fuel tanks are defueled by transferring fuel to the corresponding 1 or 3 wing tank. This function is facilitated by depresssing the FE/SO panel GRAVITY TRANSFER switch light to open the respective tank 1A/3A gravity transfer valves (Ref. 28-27-00). With the valves open, fuel will be transferred into tank 1 or 3 and out of the airplane as the respective tank 1 or 3 is defueled.

Defueling system operation is controlled using the four DEFUEL VALVES and the ISOLATION VALVE toggle switches on the

fueling/defueling panel (Ref. Fig. 2). Disagreement lights above each switch come on when the valves are in transit to the open and closed positions and indicate that the valves are responding correctly to the selected switch position. Operation of the boost pumps is described under ENGINE FEED SYSTEM (Ref. 28-24-00).

As described under PRESSURE FUELING SYSTEM - DESCRIPTION AND OPERATION (Ref. 28-21-00), 28V dc electrical power to the fueling/defueling control system is acquired from two sources; the DC GND SVCE BUS EXT which is normally selected when the FUELING/DEFUELING panel SYSTEM POWER switch is latched on, and an alternate power source which selects 28V dc aircraft battery power if external electrical power is not available at the DC GND SVCE BUS EXT (Ref. Fig. 3) The alternate power source, however, does not energize the DC BUS 1, DC BUS 2, and DC BUS 3 busses that provide defuel and manifold isolation valve open and close power.

External electrical power must therefore be applied to the dc ground service busses when defueling the aircraft.

The fuel quantity indicating system requires 115V AC power.

If only dc power is available, the fuel quantity indicators will be inoperative, and the fuel quantity sight gages will have to be monitored to determine the amount of fuel remaining in each tank.

The defueling operation is normally preceded by external grounding of the aircraft and the equipment receiving the fuel (Ref. 28-22-00), connection of the defueling hoses at the fueling/defueling hose adapters, and verification that the circuit breakers listed in Table 1 are closed.

Defueling System Circuit Breakers
Table 1

CIRCUIT BREAKERS AND LOCATIONS
On galley left circuit breaker panel
DC BUS PWR REFUELING (B21)
On galley right circuit breaker panel
FUEL SYS GA RPTR IND (15A)
REFUEL ALTN POWER (20G)
REFUEL PWR CONT (19H)

Defueling System Circuit Breakers (Cont)
Table 1

CIRCUIT BREAKERS AND LOCATIONS
FUELING VALVES (18H)
DEFUELING CONTROL PWR (16H)
On Flight Engineer/Second Officers aft circuit breaker panel CB3
INBD PUMP IND (U1 or U2)
FUEL QTY IND - TEST (T1)
R FUEL QTY IND - 1, 2L, 2R, and 3 (T2 through T5)
JTSN & DEFUEL 2L & 2R (U2) or (U3)
JTSN & DEFUEL 1 (U11)
JTSN & DEFUEL 3 (U12)
PASS SVCE BUS 1 L, R (Z9, Z10)
On pilots overhead circuit breaker panel CB1
GRAVITY FEED VALVE TANK 1A (H14) 3A (H15) (Aircraft 025-026, 028-999)

2. Defuel Valve - Tanks 2L and 2R

A. Description and Operation

One defuel valve is provided for tank 2L and one for tank 2R. The valve assembly (Ref. Fig. 4) consists of a housing and a line-replaceable plug-in element containing a reversible dc motor-operated actuator and a cylindrical rotary plug valve. The housing is attached to the fuel wetted web of the wing rear beam. The actuator and plug valve assembly is inserted through the wing beam into the housing and retained in position by a spring-loaded locking lever.

Inlet and outlet ports of the housing are connected by WIG-O-FLEX couplings to the engine fuel feed and fueling/defueling manifolds. A cylindrical sleeve within the housing has two holes that align with the housing inlet and outlet ports and the fuel passage provided in the plug. Rotation of the sleeve during plug-in element removal shuts

off the housing fuel ports and permits withdrawal of the plug-in element without a requirement to defuel the tank.

The plug-in element actuator contains a 28V dc reversible motor and gear train. Limit switches restrict motor operation to the valve open and closed positions. An external disagreement light is turned on whenever the actuator position does not agree with the command switch position. A relay is also included to prevent motor operation when power is applied to both the open and close coils at the same time.

3. Defuel Valve - Tanks 1 and 3

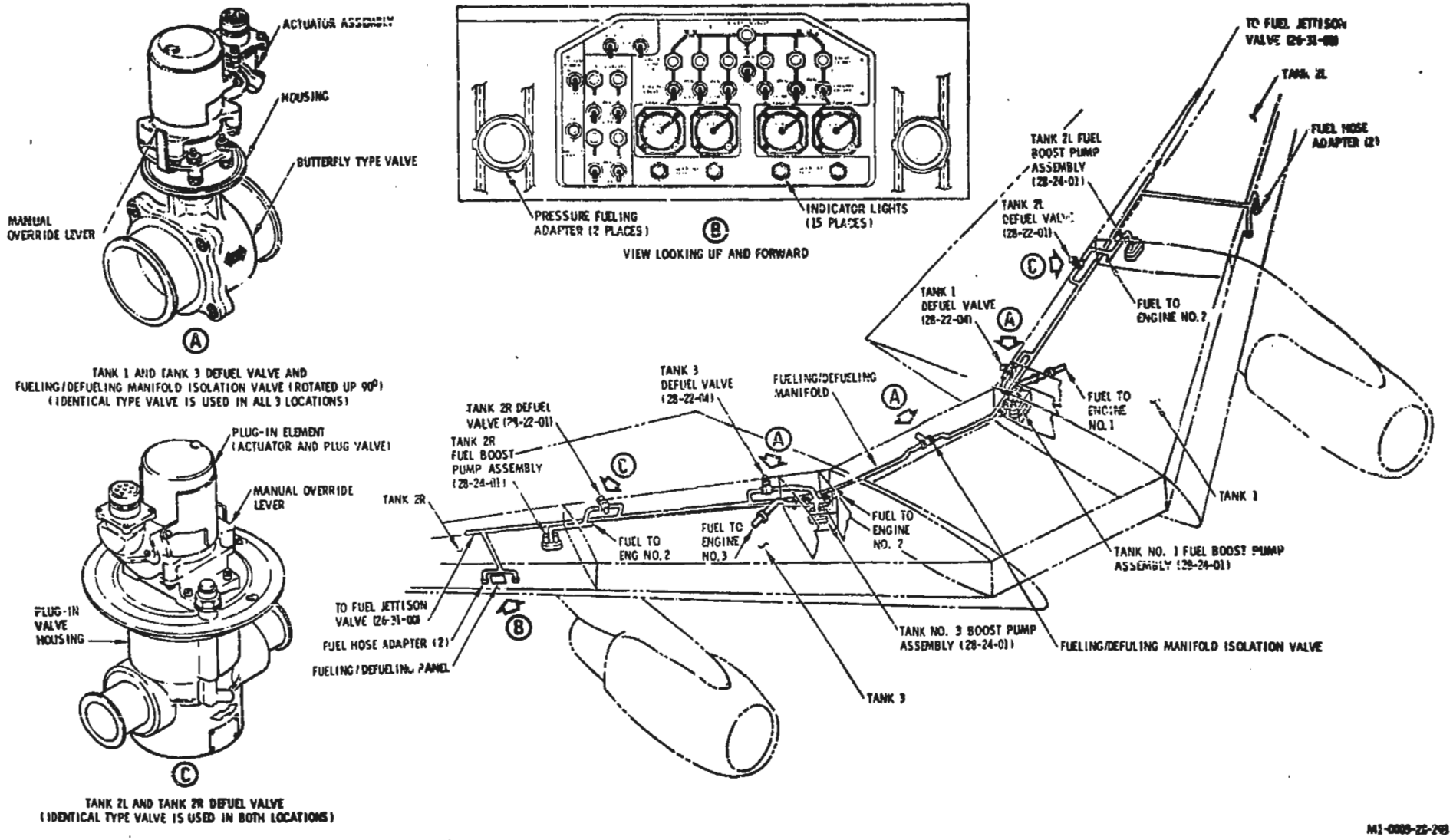
A. Description and Operation

One defuel valve is provided for tank 1 and one for tank 3. Each valve (Ref. Fig. 5) is an identical unit consisting of a valve housing containing a 2-3/4 inch butterfly disc and a 28V dc reversible motor-operated actuator. The valve is mounted inside the tank on the wing beam and connected to the engine fuel feed and fueling/defueling manifolds by WIG-O-FLEX couplings. The actuator is mounted on the aft side of the beam and supported on four studs that also pass through the beam and support the housing. The butterfly valve shaft projects through the beam and is coupled to the actuator output shaft.

The actuator is the same type of unit as is used in the tank 2L and 2R defuel valves and described in Paragraph 2. It is line-replaceable by removing the four nuts that secure the unit on the mounting studs and disengaging the actuator from the valve drive shaft.

4. System Operation

Placing a defuel or fueling/defueling manifold isolation valve switch in the OPEN position energizes the corresponding defuel or manifold isolation valve (Ref Fig. 3). Power is supplied through the appropriate defueling system power DEFUELING CONTROL PWR circuit breaker (Ref. Fig. 4) to the appropriate defuel/isolation valve switch which is electrically latched in the OPEN position. With the defuel/isolation valve control relay energized, 28V dc from DC BUS 1, 2, or 3 is applied to the valve actuator open circuit. As the valve actuator operates the valve to the full open position, the actuator-open position limit switch opens and the actuator-closed position limit switch closes, arming the actuator for reverse operation to the closed position. The actuator sequencing relay energizes and breaks the actuator motor power and disagreement light circuits. The


ACTUATOR ASSEMBLY
HOUSING
BUTTERFLY TYPE VALVE
MANUAL OVERRIDE LEVER
A
TANK 1 AND TANK 3 DEFUEL VALVE AND FUELING/DEFUELING MANIFOLD ISOLATION VALVE (ROTATED UP 90°)
(IDENTICAL TYPE VALVE IS USED IN ALL 3 LOCATIONS)
PRESSURE FUELING ADAPTER (2 PLACES)
INDICATOR LIGHTS (15 PLACES)
B
VIEW LOOKING UP AND FORWARD
TO FUEL JETTISON VALVE (28-31-00)
TANK 2L
FUEL HOSE ADAPTER (2)
TANK 2L FUEL BOOST PUMP ASSEMBLY (28-24-01)
TANK 2L DEFUEL VALVE (28-22-01)
C
TANK 1 DEFUEL VALVE (28-22-04)
FUEL TO ENGINE NO. 2
TANK 3 DEFUEL VALVE (28-22-04)
FUELING/DEFUELING MANIFOLD
FUEL TO ENGINE NO. 1
TANK 2R DEFUEL VALVE (28-22-01)
TANK 2R FUEL BOOST PUMP ASSEMBLY (28-24-01)
TANK 2R
FUEL TO ENG NO. 2
FUEL TO ENGINE NO. 3
FUEL TO ENGINE NO. 2
TANK 1
TANK NO. 1 FUEL BOOST PUMP ASSEMBLY (28-24-01)
TO FUEL JETTISON VALVE (28-31-00)
FUEL HOSE ADAPTER (2)
FUELING/DEFUELING PANEL
TANK NO. 3 BOOST PUMP ASSEMBLY (28-24-01)
FUELING/DEFULING MANIFOLD ISOLATION VALVE
TANK 3
PLUG-IN ELEMENT (ACTUATOR AND PLUG VALVE)
MANUAL OVERRIDE LEVER
PLUG-IN VALVE HOUSING
C
TANK 2L AND TANK 2R DEFUEL VALVE
(IDENTICAL TYPE VALVE IS USED IN BOTH LOCATIONS)
M1-0000-28-2A3

R
R

Defueling System
Figure 1

EFFECTIVITY: 001-024, 027

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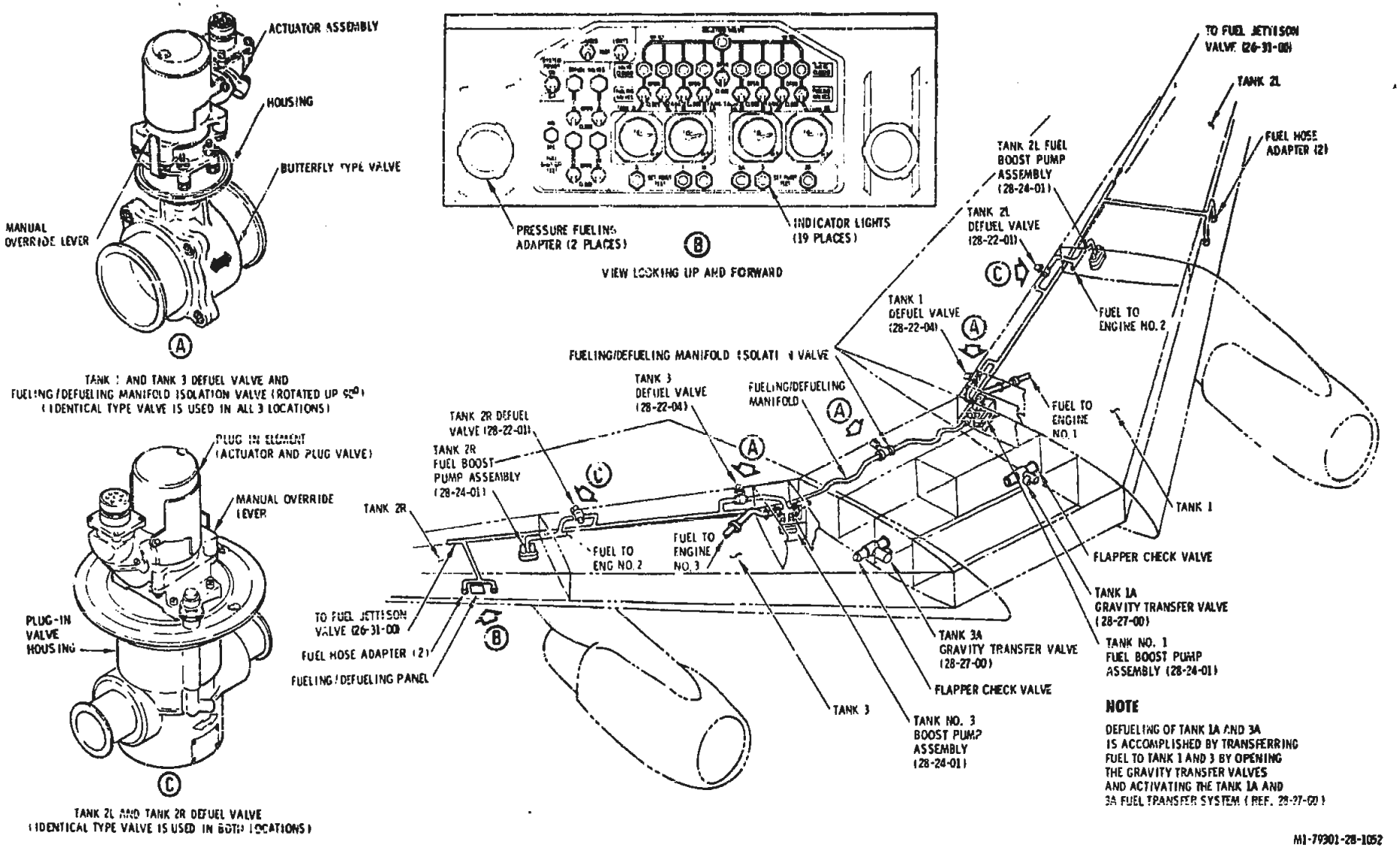
ACTUATOR ASSEMBLY
HOUSING
BUTTERFLY TYPE VALVE
MANUAL OVERRIDE LEVER
A
TANK 1 AND TANK 3 DEFUEL VALVE AND FUELING/DEFUELING MANIFOLD ISOLATION VALVE (ROTATED UP 90°)
(IDENTICAL TYPE VALVE IS USED IN ALL 3 LOCATIONS)
PLUG IN ELEMENT (ACTUATOR AND PLUG VALVE)
MANUAL OVERRIDE LEVER
PLUG-IN VALVE HOUSING
C
TANK 2L AND TANK 2R DEFUEL VALVE
(IDENTICAL TYPE VALVE IS USED IN BOTH LOCATIONS)
PRESSURE FUELING ADAPTER (2 PLACES)
INDICATOR LIGHTS (19 PLACES)
B
VIEW LOOKING UP AND FORWARD
TO FUEL JETTISON VALVE (26-31-00)
TANK 2L
FUEL HOSE ADAPTER (2)
TANK 2L FUEL BOOST PUMP ASSEMBLY (28-24-01)
TANK 2L DEFUEL VALVE (28-22-01)
FUEL TO ENGINE NO. 2
TANK 1 DEFUEL VALVE (28-22-04)
FUELING/DEFUELING MANIFOLD ISOLATION VALVE
TANK 3 DEFUEL VALVE (28-22-04)
FUELING/DEFUELING MANIFOLD
TANK 2R DEFUEL VALVE (28-22-01)
TANK 2R FUEL BOOST PUMP ASSEMBLY (28-24-01)
FUEL TO ENGINE NO. 1
TANK 2R
FUEL TO ENG NO. 2
FUEL TO ENGINE NO. 3
TANK 1
FLAPPER CHECK VALVE
TANK 1A GRAVITY TRANSFER VALVE (28-27-00)
TANK NO. 1 FUEL BOOST PUMP ASSEMBLY (28-24-01)
TO FUEL JETTISON VALVE (26-31-00)
FUEL HOSE ADAPTER (2)
FUELING/DEFUELING PANEL
TANK 3
TANK 3A GRAVITY TRANSFER VALVE (28-27-00)
FLAPPER CHECK VALVE
TANK NO. 3 BOOST PUMP ASSEMBLY (28-24-01)
NOTE
DEFUELING OF TANK 1A AND 3A IS ACCOMPLISHED BY TRANSFERRING FUEL TO TANK 1 AND 3 BY OPENING THE GRAVITY TRANSFER VALVES AND ACTIVATING THE TANK 1A AND 3A FUEL TRANSFER SYSTEM (REF. 28-27-00)
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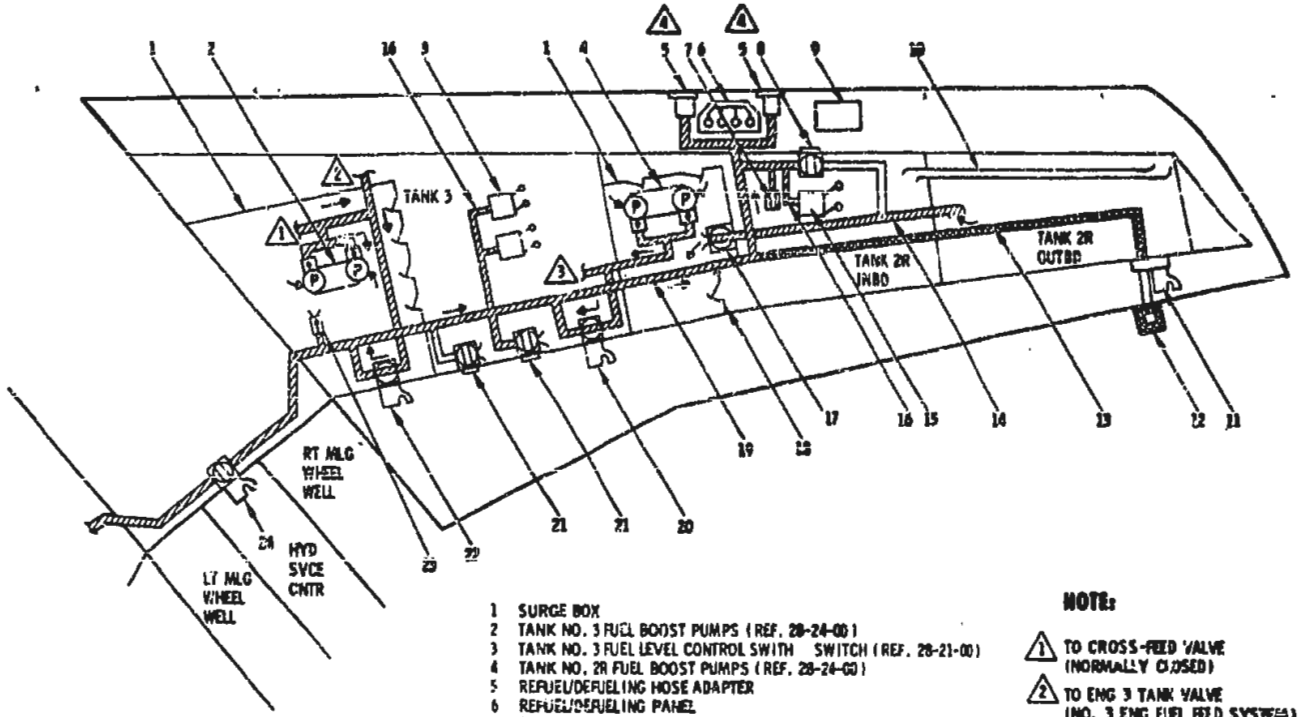
Defueling System
Figure 1



1 SURGE BOX
2 TANK NO. 3 FUEL BOOST PUMPS (REF. 28-24-00)
3 TANK NO. 3 FUEL LEVEL CONTROL SWITH SWITCH (REF. 28-21-00)
4 TANK NO. 2R FUEL BOOST PUMPS (REF. 28-24-00)
5 REFUEL/DEFUELING HOSE ADAPTER
6 REFUEL/DEFUELING PANEL (RIGHT WING ONLY)
7 REFUEL/DEFUEL MANIFOLD VENT FITTING
8 TANK NO. 2R FUELING VALVE (REF. 28-21-00)
9 INTERPHONE AND GND JACK PANEL (FUEL LEVEL CONTROL BYPASS SWITCHES)
10 HIGH-LEVEL FUEL TRANSFER MANIFOLD
11 FUEL JETTISON VALVE (REF. 28-31-00)
12 FLAME ARRESTOR (REF. 28-31-00)
13 FUEL JETTISON MANIFOLD (REF. 28-31-00)
14 LOW-LEVEL FUEL TRANSFER MANIFOLD
15 TANK NO. 2R FUEL LEVEL CONTROL SWITCH (REF. 28-21-00)
16 PRECHECK FUEL PRESSURE (TO FUEL LEVEL CONTROL SWITCH ASSY) (REF. 28-21-00)
17 FUEL TRANSFER VALVE (FLOAT ACTUATED)
18 FLAPPER CHECK VALVE (TYP)
19 REFUEL/DEFUEL MANIFOLD
20 TANK NO. 2R PUMP-DEFUELING VALVE
21 TANK NO. 3 FUELING VALVE (REF. 28-21-00)
22 TANK NO. 3 PUMP-DEFUELING VALVE
23 REFUEL/DEFUEL MANIFOLD DRAIN VALVE
24 REFUEL/DEFUEL MANIFOLD ISOLATION VALVE

NOTE:

1. TO CROSS-FEED VALVE (NORMALLY CLOSED)
2. TO ENG 3 TANK VALVE (NO. 3 ENG FUEL FEED SYSTEM)
3. TO FUEL FLOW EQUALIZER (NO. 2 ENG FUEL FEED SYSTEM)
4. TO EXTERNAL DEFUELING EQUIPMENT

(5) RIGHT WING SHOWN - LEFT WING IDENTICAL EXCEPT FOR TANK 2R AND 1 COMPONENT NOMENCLATURE

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R
R

Defueling System Diagram
Figure 2

EFFECTIVITY: 001-024, 027

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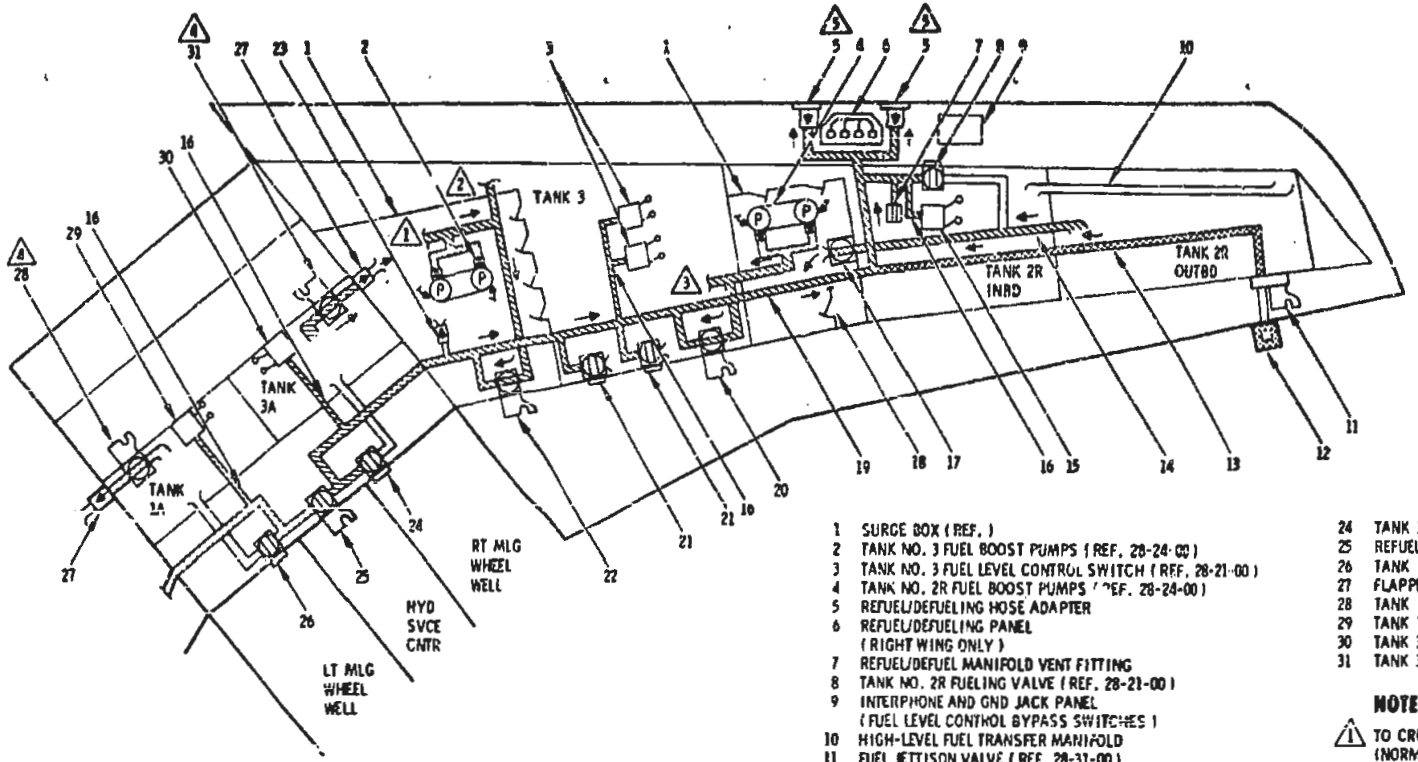

1 SURGE BOX (REF.)
2 TANK NO. 3 FUEL BOOST PUMPS (REF. 28-24-00)
3 TANK NO. 3 FUEL LEVEL CONTROL SWITCH (REF. 28-21-00)
4 TANK NO. 2R FUEL BOOST PUMPS (REF. 28-24-00)
5 REFUEL/DEFUELING HOSE ADAPTER
6 REFUEL/DEFUELING PANEL (RIGHT WING ONLY)
7 REFUEL/DEFUEL MANIFOLD VENT FITTING
8 TANK NO. 2R FUELING VALVE (REF. 28-21-00)
9 INTERPHONE AND GND JACK PANEL (FUEL LEVEL CONTROL BYPASS SWITCHES)
10 HIGH-LEVEL FUEL TRANSFER MANIFOLD
11 FUEL JETTISON VALVE (REF. 28-31-00)
12 FLAME ARRESTOR (REF. 28-31-0)
13 FUEL JETTISON MANIFOLD (REF. 28-31-00)
14 LOW-LEVEL FUEL TRANSFER MANIFOLD (REF. 28-27-00)
15 TANK NO. 2R FUEL LEVEL CONTROL SWITCH (REF. 28-21-00)
16 PRECHECK FUEL PRESSURE (TO FUEL LEVEL CONTROL SWITCH ASSY) (REF. 28-21-00)
17 FUEL TRANSFER VALVE (FLOAT ACTUATED)
18 FLAPPER CHECK VALVE (TYP)
19 REFUEL/DEFUEL MANIFOLD
20 TANK NO. 2R PUMP-DEFUELING VALVE
21 TANK NO. 3 FUELING VALVE (REF. 28-21-00)
22 TANK NO. 3 PUMP-DEFUELING VALVE
23 REFUEL/DEFUEL MANIFOLD DRAIN VALVE
24 TANK 3A FUELING VALVE (REF. 28-21-00)
25 REFUEL/DEFUEL MANIFOLD ISOLATION VALVE
26 TANK 1A FUELING VALVE (REF. 28-21-00)
27 FLAPPER CHECK VALVE
28 TANK 1A GRAVITY TRANSFER VALVE
29 TANK 1A FUEL LEVEL CONTROL SWITCH ASSY (REF. 28-21-00)
30 TANK 3A FUEL LEVEL CONTROL SWITCH ASSY (REF. 28-21-00)
31 TANK 3A GRAVITY TRANSFER VALVE

NOTE

1. TO CROSS-FEED VALVE (NORMALLY CLOSED)
2. TO ENG 3 TANK VALVE (NO. 3 ENG FUEL FEED SYSTEM)
3. TO FUEL EQUALIZER (NO. 2 ENG FUEL FEED SYSTEM)
4. DEFUELING OF TANK 1A AND 3A IS ACCOMPLISHED BY TRANSFERRING FUEL TO TANK 1 AND 3 THROUGH GRAVITY TRANSFER VALVES. TANK 1A/3A FUEL TRANSFER SYSTEM IS NORMALLY ACTIVATED TO INCREASE RATE OF FUEL TRANSFER TO TANK 1 AND 3 (REF. 28-27-00)
5. TO EXTERNAL DEFUELING EQUIPMENT

(6) RIGHT WING SHOWN LEFT WING IDENTICAL EXCEPT FOR TANK 2R and 1 COMPONENT NOMENCLATURE

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Defueling System Diagram
Figure 2

R EFFECTIVITY: 025-026, 028-999
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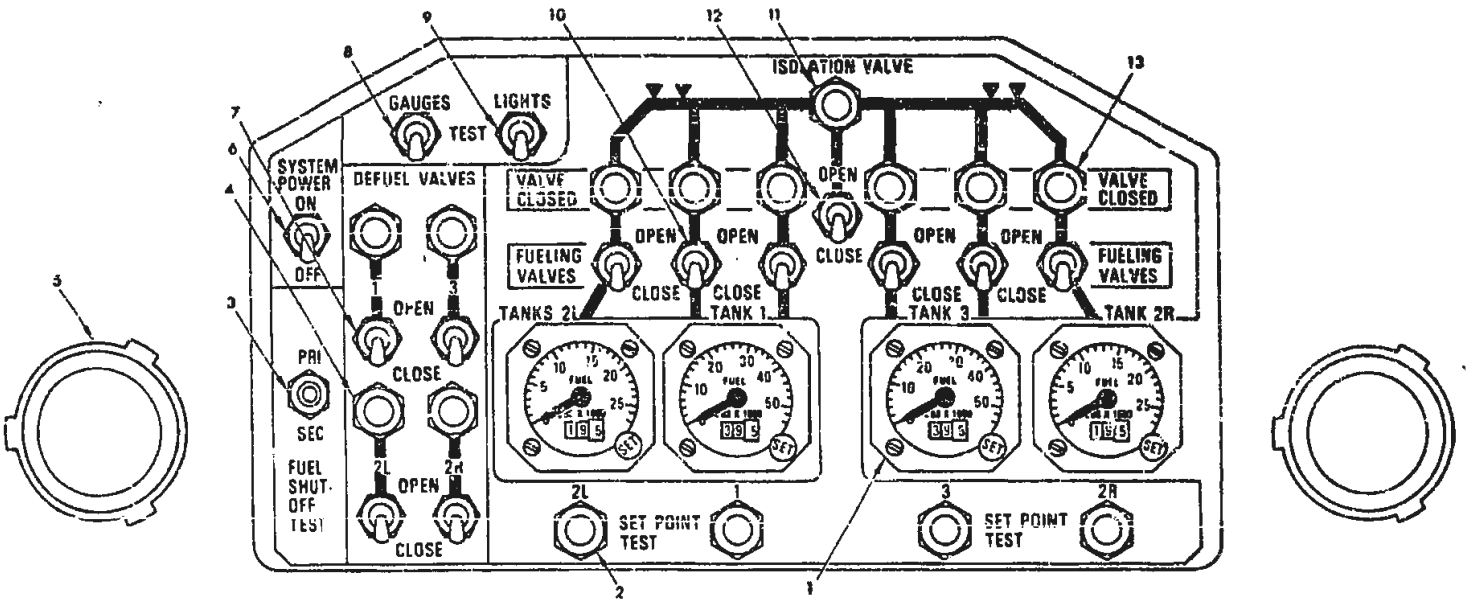

1 FUEL QUANTITY INDICATOR (4 PLACES)

- PROVIDES DIGITAL AND ANALOG INDICATION OF FUEL QUANTITY
- INCORPORATES SET POINT INDEX TO PERMIT SELECTION OF DESIRED FUEL QUANTITY. REFUELING IS AUTOMATICALLY TERMINATED WHEN INDICATOR POINTER REACHES INDEX SETTING. TERMINATION OF FUEL FLOW INTO TANK IS INDICATED WHEN CORRESPONDING SET POINT TEST LIGHT GOES OUT AND VALVE CLOSED LIGHT(S) COMES ON

2 SET POINT TEST LIGHT (4 PLACES)

- PROVIDES INDICATION OF AUTOMATIC SHUTOFF OF REFUELING FLOW. LIGHT GOES OUT WHEN INDICATOR POINTER PASSES SET POINT INDEX

3 FUEL SHUTOFF TEST SWITCH

- SWITCH IS DOUBLE-POLE DOUBLE-THROW MOMENTARY CONTACT TYPE WITH CENTER OFF POSITION
- PRIMARY AND SECONDARY POSITIONS SIMULATE FULL TANK CONDITION TO TEST AUTOMATIC FUEL SHUTOFF OPERATION. THE TEST VERIFIES OPERATION OF THE PRIMARY AND SECONDARY PILOT VALVES IN THE FUELING VALVES AND PRIMARY AND SECONDARY SWITCHES IN THE CORRESPONDING FUEL LEVEL CONTROL SWITCHES
- PROPER TEST RESULT IS INDICATED BY ALL VALVE CLOSED LIGHTS COMING ON

4 DEFUEL VALVES LIGHT (4 PLACES)

- LIGHT NORMALLY BLINKS ON, THEN OFF WHEN VALVE IS IN-TRANSIT TO OPEN OR CLOSED POSITION. IF ON STEADY, VALVE IS NOT IN AGREEMENT WITH SWITCH POSITION

5 REFUEL/DEFUELING NOZZLE ADAPTER (2 PLACES)

- INCORPORATES PROVISIONS FOR ATTACHING STANDARD FUEL HOSE NOZZLES. TWO ADAPTERS ALSO LOCATED IN LEFT WING
- NOZZLE ATTACHMENT FLANGE IS DESIGNED TO BREAKAWAY IF PRE-DETERMINED CRITICAL FORCE IS APPLIED TO ADAPTERS THROUGH FUELING HOSES
- BROKEN NOZZLE ATTACHMENT FLANGES CAN BE REPLACED WITHOUT DISASSEMBLY. INTERNAL SPRING LOADED POPPET CLOSES ADAPTER PORT
- TWO REFUEL/DEFUELING NOZZLE ADAPTERS ARE ALSO LOCATED IN LEFT WING LEADING EDGE, ZONE 621 FB

6 SYSTEM POWER SWITCH

- CONTROLS APPLICATION OF ELECTRICAL POWER TO REFUEL/DEFUELING SYSTEM
- WHEN THE SWITCH IS ELECTRICALLY LATCHED IN ON POSITION, SERVICE PANEL LIGHTS COME ON, FUEL QUANTITY INDICATORS ARE POWERED, FUEL SHUTOFF TEST CIRCUIT IS ARMED, VALVE CLOSED INDICATOR LIGHTS COME ON, AND REFUEL POWER SWITCHLIGHT ON FLIGHT ENGINEER/SECOND OFFICERS FUEL SYSTEM PANEL COMES ON
- IF INADVERTENTLY LEFT ON, SYSTEM POWER SWITCH CAN BE UNLATCHED TO OFF POSITION BY DEPRESSING REFUEL POWER SWITCHLIGHT

7 DEFUEL VALVES SWITCH (4 PLACES)

- OPENS OR CLOSES DEFUELING VALVES

8 GAUGES TEST SWITCH

- WHEN HELD IN POSITION, SWITCH CHECKS OPERATION OF FUEL QUANTITY INDICATORS
- ALL FUEL QUANTITY INDICATORS DRIVE FULL UPSCALE
- CORRESPONDING SET POINT LIGHTS GO OUT
- ANY FUELING VALVE THAT IS OPEN WILL CLOSE
- SWITCH OPERATES IN PARALLEL WITH QTY TEST SWITCH ON FLIGHT ENGINEER/SECOND OFFICERS FUEL SYSTEM PANEL

9 INDICATOR LIGHTS TEST SWITCH

- TEST ON PANEL INDICATOR LIGHTS. ANY LIGHT NOT ALREADY ON WILL COME ON WHEN SWITCH IS HELD IN TEST POSITION

10 FUELING VALVE CONTROL SWITCH (6 PLACES)

- ARMS FUELING VALVE CIRCUIT FOR OPEN OPERATION
- FUEL PRESSURE IS REQUIRED TO OPEN FUELING VALVE

11 ISOLATION VALVE LIGHT

- LIGHT NORMALLY BLINKS ON, THEN OFF, WHEN VALVE IS IN-TRANSIT TO OPEN OR CLOSED POSITION. IF ON STEADY, VALVE IS NOT IN AGREEMENT WITH SWITCH POSITION

12 ISOLATION VALVE SWITCH

- OPENS REFUEL/DEFUELING MANIFOLD ISOLATION VALVE TO PERMIT REFUEL/DEFUELING OF ALL TANKS THROUGH ADAPTERS IN ONE WING ONLY
- PERMITS CROSS-SHIP TRANSFER OF FUEL BY MAINTENANCE PERSONNEL

13 FUELING VALVE POSITION LIGHT (6 PLACES)

- LIGHT IS ON WHEN CORRESPONDING FUELING VALVE IS CLOSED

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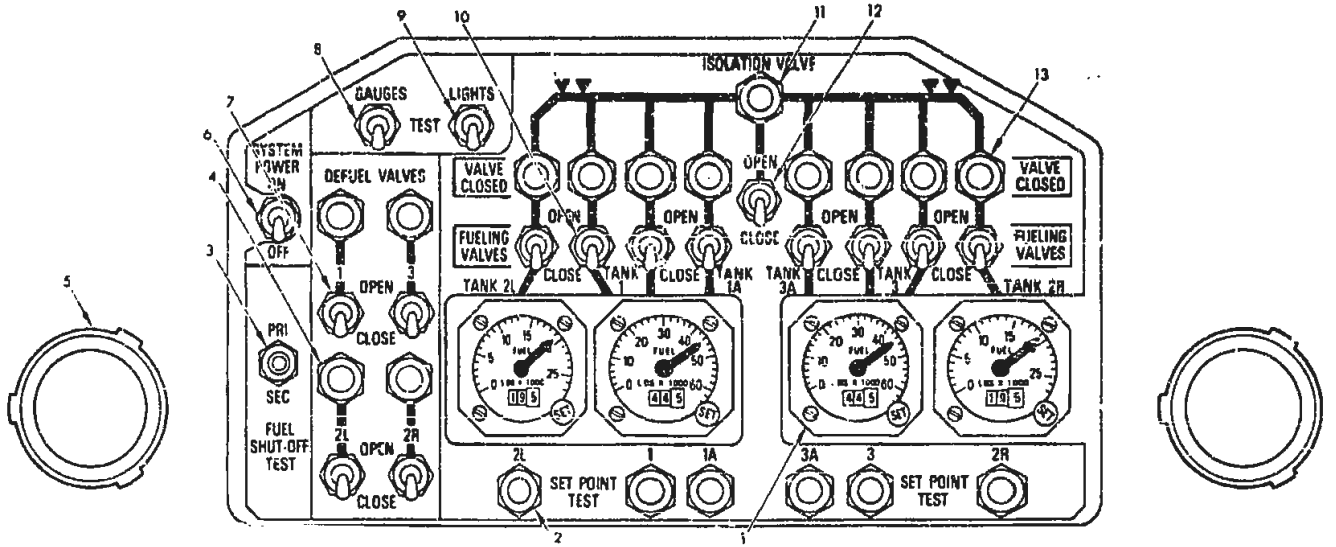
Fueling/Defueling Panel
Figure 3



1 FUEL QUANTITY INDICATOR (4 PLACES)

- PROVIDES DIGITAL AND ANALOG INDICATION OF FUEL QUANTITY (REF. 28-41-00).
- INCORPORATES SET POINT INDEX TO PERMIT SELECTION OF DESIRED FUEL QUANTITY. REFUELING IS AUTOMATICALLY TERMINATED WHEN INDICATOR POINTER REACHES INDEX SETTING. TERMINATION OF FUEL FLOW INTO TANK IS INDICATED WHEN CORRESPONDING SET POINT TEST LIGHT GOES OFF AND VALVE CLOSED LIGHT COMES ON (REF. 28-21-00)

2 SET POINT TEST LIGHT (6 PLACES) (REF. 28-21-00)

- PROVIDES INDICATION OF AUTOMATIC SHUTOFF OF FUELING FLOW. LIGHT GOES OFF WHEN INDICATOR POINTER PASSES SET POINT INDEX (REF. 28-21-00)

3 FUEL SHUTOFF TEST SWITCH (REF. 28-21-00)

- SWITCH IS DOUBLE-POLE DOUBLE-THROW MOMENTARY CONTACT TYPE WITH CENTER OFF POSITION
- PRIMARY AND SECONDARY POSITIONS SIMULATE FUEL TANK CONDITION TO TEST AUTOMATIC FUEL SHUTOFF OPERATION. THE TEST VERIFIES OPERATION OF THE PRIMARY AND SECONDARY PILOT VALVES IN THE FUELING VALVES AND PRIMARY AND SECONDARY SWITCHES IN THE CORRESPONDING FUEL LEVEL CONTROL SWITCHES
- PROPER TEST RESULT IS INDICATED BY ALL VALVE CLOSED LIGHTS COMING ON

4 DEFUEL VALVES LIGHT (4 PLACES) (REF. 28-22-00)

- LIGHT NORMALLY BLINKS ON, THEN OFF WHEN VALVE IS IN-TRANSIT TO OPEN OR CLOSED POSITION. IF ON STEADY, VALVE IS NOT IN AGREEMENT WITH SWITCH POSITION

5 FUELING/DEFUELING NOZZLE ADAPTER (2 PLACES) (REF. 28-21-00)

- INCORPORATES PROVISIONS FOR ATTACHING STANDARD FUEL HOSE NOZZLES
- NOZZLE ATTACHMENT FLANGE IS DESIGNED TO BREAKAWAY IF PRE-DETERMINED CRITICAL FORCE IS APPLIED TO ADAPTERS THROUGH FUELING HOSES
- BROKEN NOZZLE ATTACHMENT FLANGES CAN BE REPLACED WITHOUT DISASSEMBLY. INTERNAL SPRING LOADED POPPET CLOSES ADAPTER PORT
- TWO FUELING/DEFUELING NOZZLE ADAPTERS ARE ALSO LOCATED IN LEFT WING LEADING EDGE, ZONE 521 FB

6 SYSTEM POWER SWITCH (REF. 28-21-00)

- CONTROLS APPLICATION OF ELECTRICAL POWER TO FUELING/DEFUELING SYSTEM
- WHEN THE SWITCH IS ELECTRICALLY LATCHED IN ON POSITION, SERVICE PANEL LIGHTS COME ON, FUEL QUANTITY INDICATORS ARE POWERED, FUEL SHUTOFF TEST CIRCUIT IS ARMED, VALVE CLOSED INDICATOR LIGHTS COME ON, AND REFUEL POWER SWITCHLIGHT ON FLIGHT ENGINEER'S/SECOND OFFICERS FUEL SYSTEM PANEL COMES ON
- IF INADVERTENTLY LEFT ON, SYSTEM POWER SWITCH CAN BE UNLATCHED TO OFF POSITION BY DEPRESSING REFUEL POWER SWITCHLIGHT

7 DEFUEL VALVES SWITCH (4 PLACES) (REF. 28-22-00)

- OPENS OR CLOSES DEFUELING VALVES

8 GAUGES TEST SWITCH (REF. 28-41-00)

- WHEN HELD IN POSITION, SWITCH CHECKS OPERATION OF FUEL QUANTITY INDICATORS
- ALL FUEL QUANTITY INDICATORS DRIVE FULL UPSCALE
- CORRESPONDING SET POINT LIGHTS GO OUT
- ANY FUELING VALVE THAT IS OPEN WILL CLOSE
- SWITCH OPERATES IN PARALLEL WITH QUANTITY TEST SWITCH ON FLIGHT ENGINEER'S/SECOND OFFICERS FUEL SYSTEM PANEL

9 INDICATOR LIGHTS TEST SWITCH (REF. 28-21-00)

- TESTS PANEL INDICATOR LIGHTS. ANY LIGHT NOT ALREADY ON WILL COME ON WHEN SWITCH IS HELD IN TEST POSITION

10 FUELING VALVE CONTROL SWITCH (8 PLACES) (REF. 28-21-00)

- ARMS FUELING VALVE CIRCUIT FOR OPEN OPERATION
- FUEL PRESSURE IS REQUIRED TO OPEN FUELING VALVE

11 ISOLATION VALVE LIGHT (REF. 28-21-00)

- LIGHT NORMALLY BLINKS ON, THEN OFF, WHEN VALVE IS IN-TRANSIT TO OPEN OR CLOSED POSITION. IF ON STEADY, VALVE IS NOT IN AGREEMENT WITH SWITCH POSITION

12 ISOLATION VALVE SWITCH (REF. 28-21-00)

- OPENS FUELING/DEFUELING MANIFOLD ISOLATION VALVE TO PERMIT FUELING/DEFUELING OF ALL TANKS THROUGH ADAPTERS IN ONE WING ONLY
- PERMITS CROSS-SHIP TRANSFER OF FUEL BY MAINTENANCE PERSONNEL

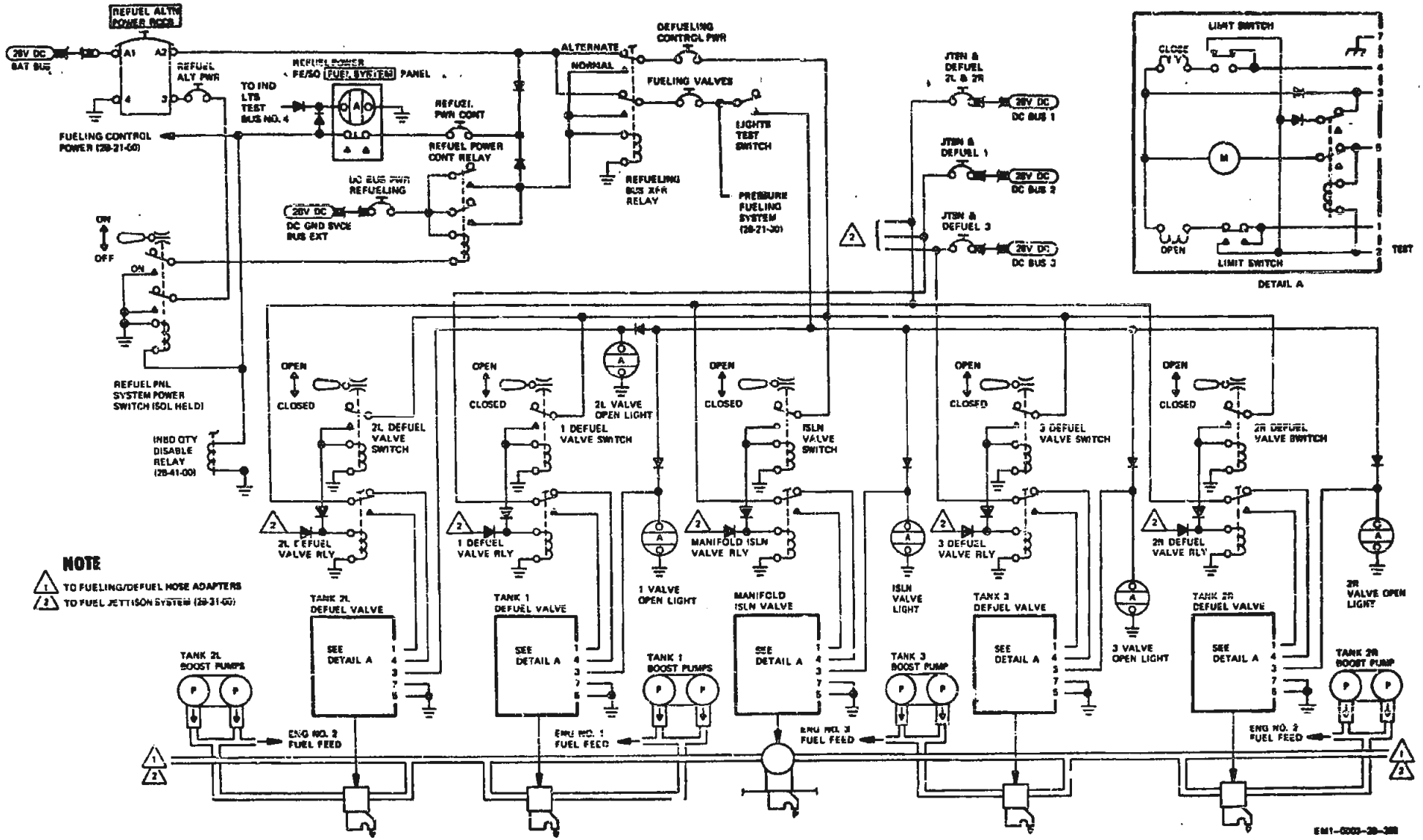
13 FUELING VALVE POSITION LIGHT (8 PLACES) (REF. 28-21-00)

- LIGHT IS ON WHEN CORRESPONDING FUELING VALVE IS CLOSED

M1-25001-28-1036

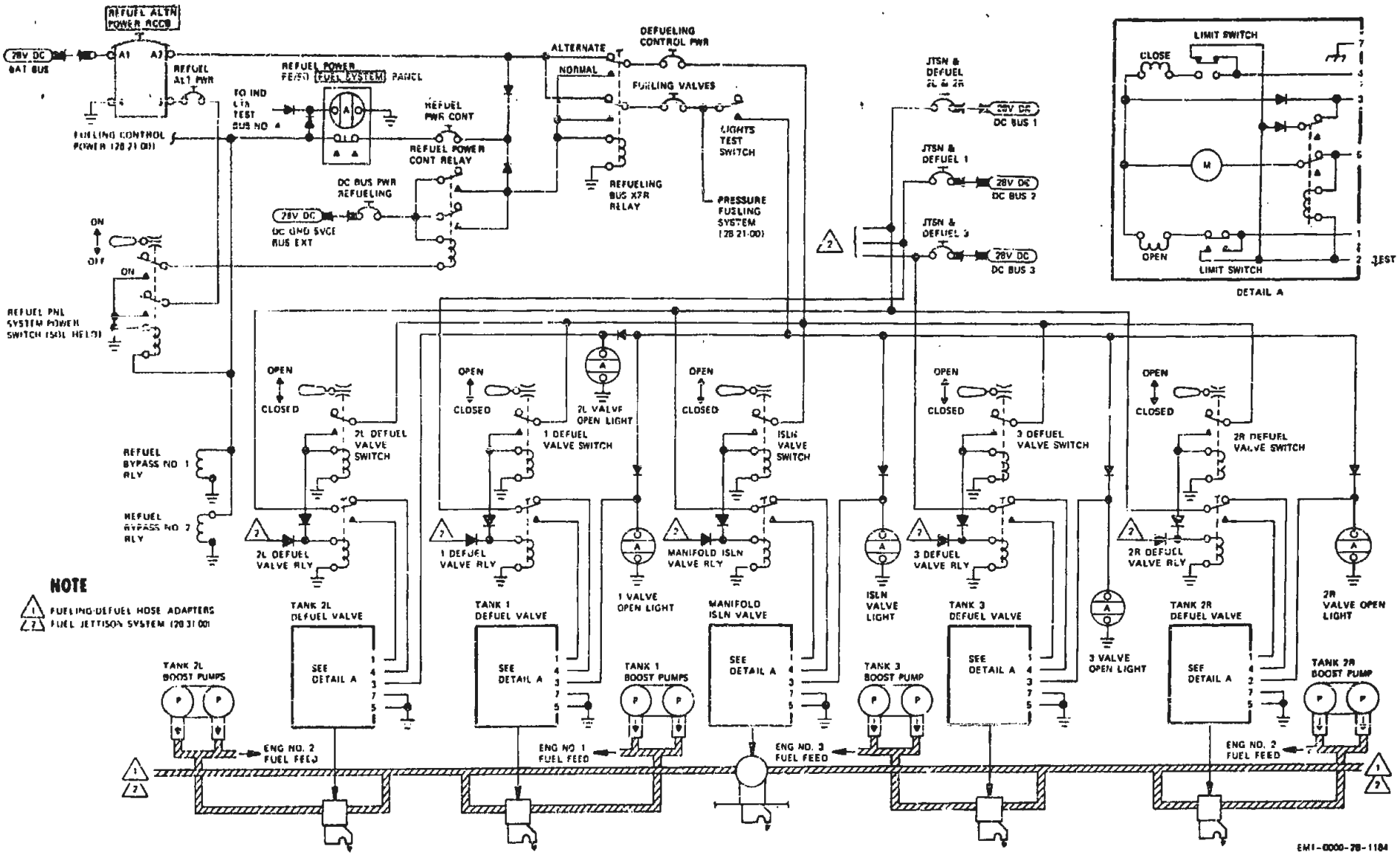
Fueling/Defueling Panel
Figure 3

R EFFECTIVITY: 025-026, 028-999
R
0018



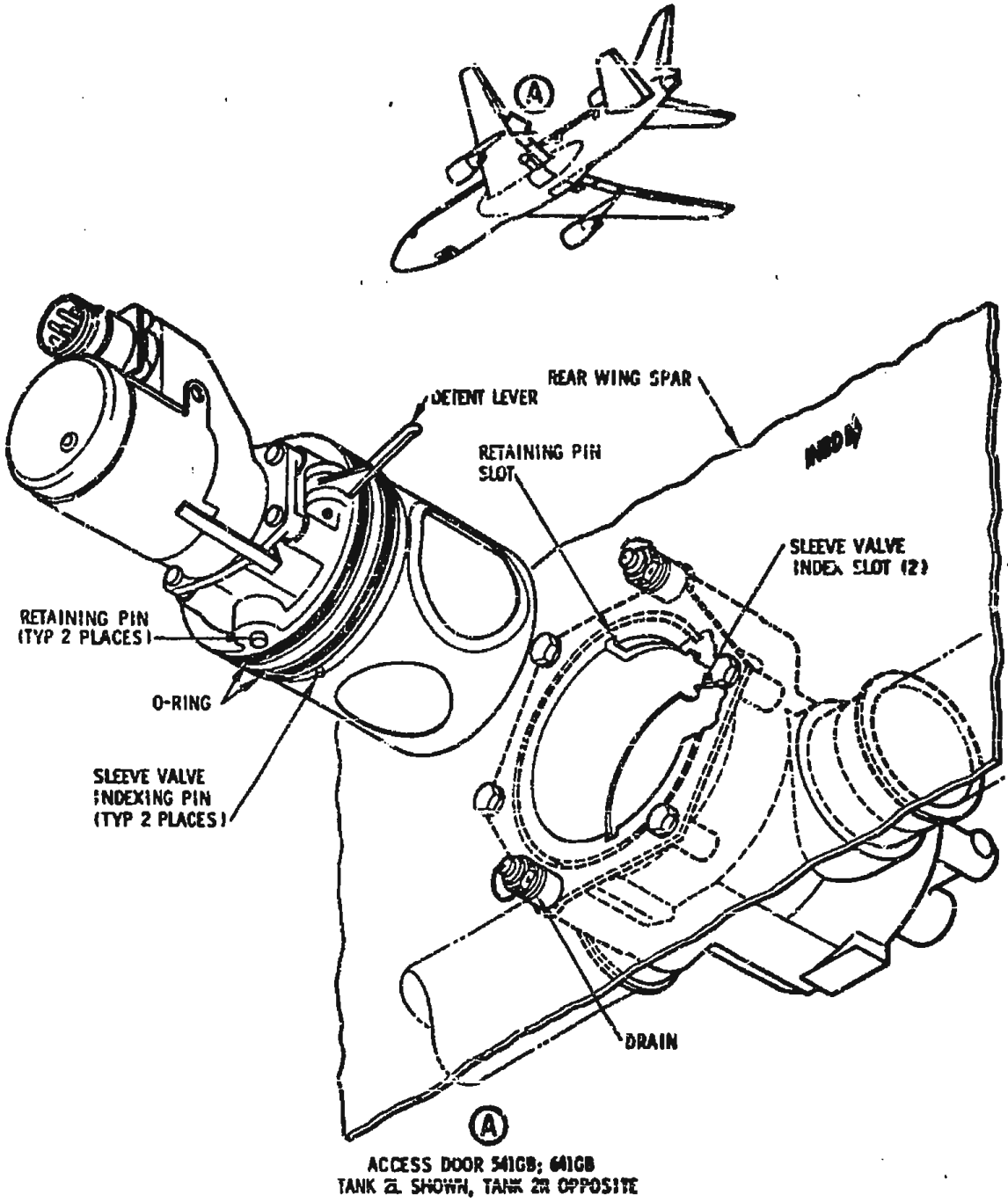
Defuel System Simplified Schematic
Figure 4

EFFECTIVITY: 001-024, 027



Defuel System Simplified Schematic
Figure 4

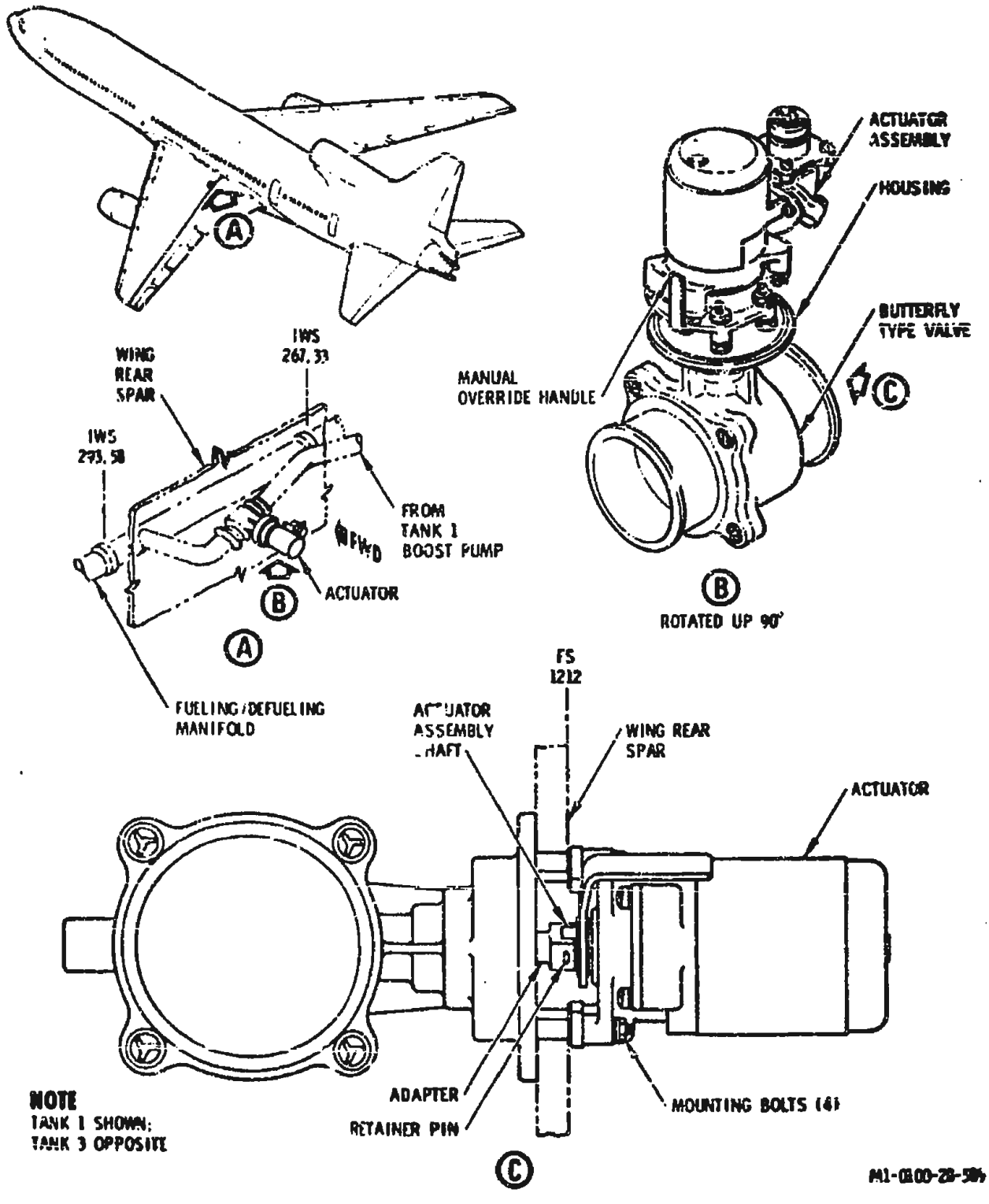
R
R
0018 EFFECTIVITY: 025-026, 028-999



M1-0100-28-650

R Defuel Valve - Tanks 2L and 2R
R Figure 5

R EFFECTIVITY: ALL
R
0018



Defuel Valve - Tanks 1 and 3
Figure 6

EFFECTIVITY: ALL

valve-open cycle is terminated and the disagreement light goes out. The sequencing relay remains energized. If fueling/defueling power is interrupted by actuation of the SYSTEM POWER switch or FE/SO panel REFUEL POWER switch, the defuel valve switch solenoid hold circuits are broken and the defuel and manifold isolation valve control relays deenergize. The sequencing relay in the actuator relaxes. Valve actuator dc power is then applied to the valve actuator-closed circuits and the valves go closed. The REFUEL POWER switch thus allows the Flight Engineer/Second Officer to remove fueling/defueling panel power and assure that the defuel and manifold isolation valves are closed in event the aircraft is released for flight with the SYSTEM POWER switch inadvertently left in the ON position.

When a defuel valve or isolation valve switch is closed, the valve control switch hold circuit is deenergized and the valve control relay relaxes. This removes the dc power holding the valve actuator sequencing relay energized. The relay relaxes and provides the ground required for actuator motor operation to the closed position. DC BUS 1, 2, or 3 power is now applied through the relaxed valve control relay and actuator-closed position limit switch to the actuator motor. As the valve closes, the closed position limit switch opens and the open position limit switch closes, arming the actuator for an open cycle operation. The disagreement light is on while the valve is in-transit and goes out when the limit switch opens.

R

DEFUELING SYSTEM - FAULT ISOLATION

R 1. General

R Reference data and fault isolation procedures for troubleshooting defueling system faults are included in this section of the manual. A system malfunction detected by the flight crew is normally entered in the aircraft flight log book and reported to maintenance personnel by a FIRM fault code number. This number and the flight log book write-up can be found in the Chapter 28 Fault Code Index. The index specifies the maintenance manual section, fault isolation diagram figure number and, where appropriate, a block number indicating the diagram entry point containing the fault isolation procedure. When no block number is specified, the diagram entry point is block 1.

R Prerequisites listed at the top of each diagram identify mandatory preliminary steps and circuit breakers that must be closed before initiating any fault isolation step.

R Schematic diagrams, identified by a SCHEM number, supplement fault isolation procedures as maintenance aids. The schematics show the basic system circuitry necessary for troubleshooting and include cross-reference indexes to the wiring diagram manual pages required for checking component interconnect wiring.

R 2. Fault Isolation

R Table 101 is a list of fault isolation data in this section of the manual.

R Fault Isolation Data
R Table 101

FIGURE NUMBER	TITLE
103	Defueling Valve Problems
SCHEM 1	Defueling System Schematic

COMPONENT	QTY	AREA/ACCESS	REFERENCE
ADAPTER – PRESSURE FUELING VALVE	4	WING LE SECTION/521FB, 621FB	28-21-01
CIRCUIT BREAKERS:			
DEFUEL CONT PWR (2822-CB1)	1	GALLEY RT CB PNL/H1B	*
JTSN & DEFUEL TANK 1 (2831-CB2)	1	FLT STA/CB3 U11	*
JTSN & DEFUEL TANK 3 (2831-CB4)	1	FLT STA/CB3 U12	*
JTSN & DEFUEL TANK 2L/2R (2831-CB1)	1	FLT STA/CB3 U3	*
PANEL – REFUELING/DEFUELING	1	RT WING LE/621FB	28-21-99
RELAYS:			
1 DEFUEL VALVE (2831-K3)	1	MESC/192K, 137AZ	*
2L DEFUEL VALVE (2831-K4)	1	MESC/192K, 137AZ	*
2R DEFUEL VALVE (2831-K2)	1	MESC/192K, 137AZ	*
3 DEFUEL VALVE (2831-K1)	1	MESC/192K, 137AZ	*
REFUEL BUS TRANSFER (2821-K1)	1	MESC/192K, 137AZ	*
SWITCH – DEFUEL VALVE	4	RT WING LE/621FB	*
VALVE ACTUATORS/PLUG-IN ASSEMBLIES			
TANK 1 DEFUEL	1	LT WING/541AB	28-22-05
TANK 2L DEFUEL	1	LT WING/541GB	28-22-02
TANK 2R DEFUEL	1	RT WING/641GB	28-22-02
TANK 3 DEFUEL	1	RT WING/641AB	28-22-05
VALVE			
TANK 1 DEFUEL	1	LT WING/531DB	28-22-04
TANK 3 DEFUEL	1	RT WING/631DB	28-22-04

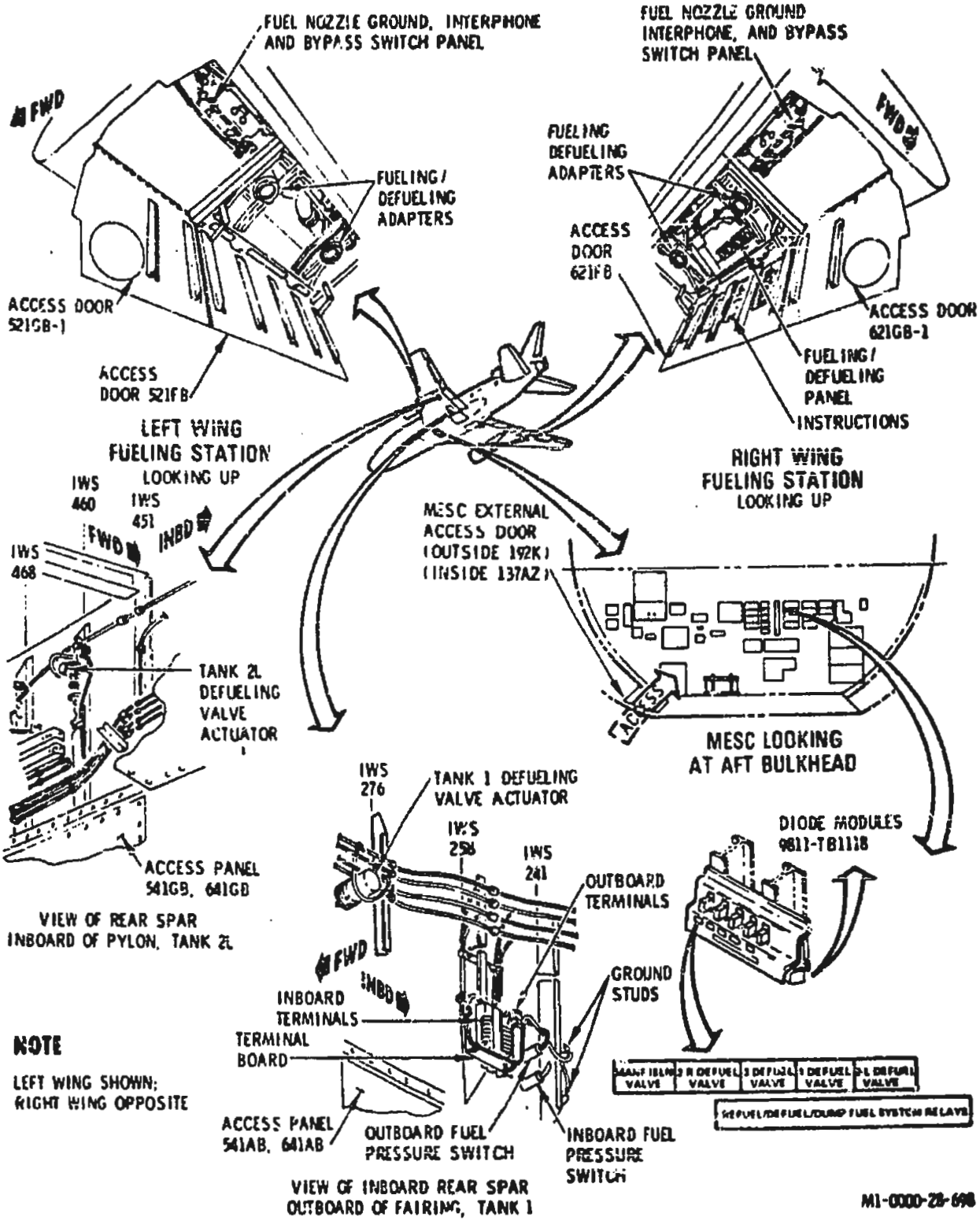
*SEE WM EQUIPMENT LIST

M1-0001-28-1484

R Component Locator Index
R Figure 101

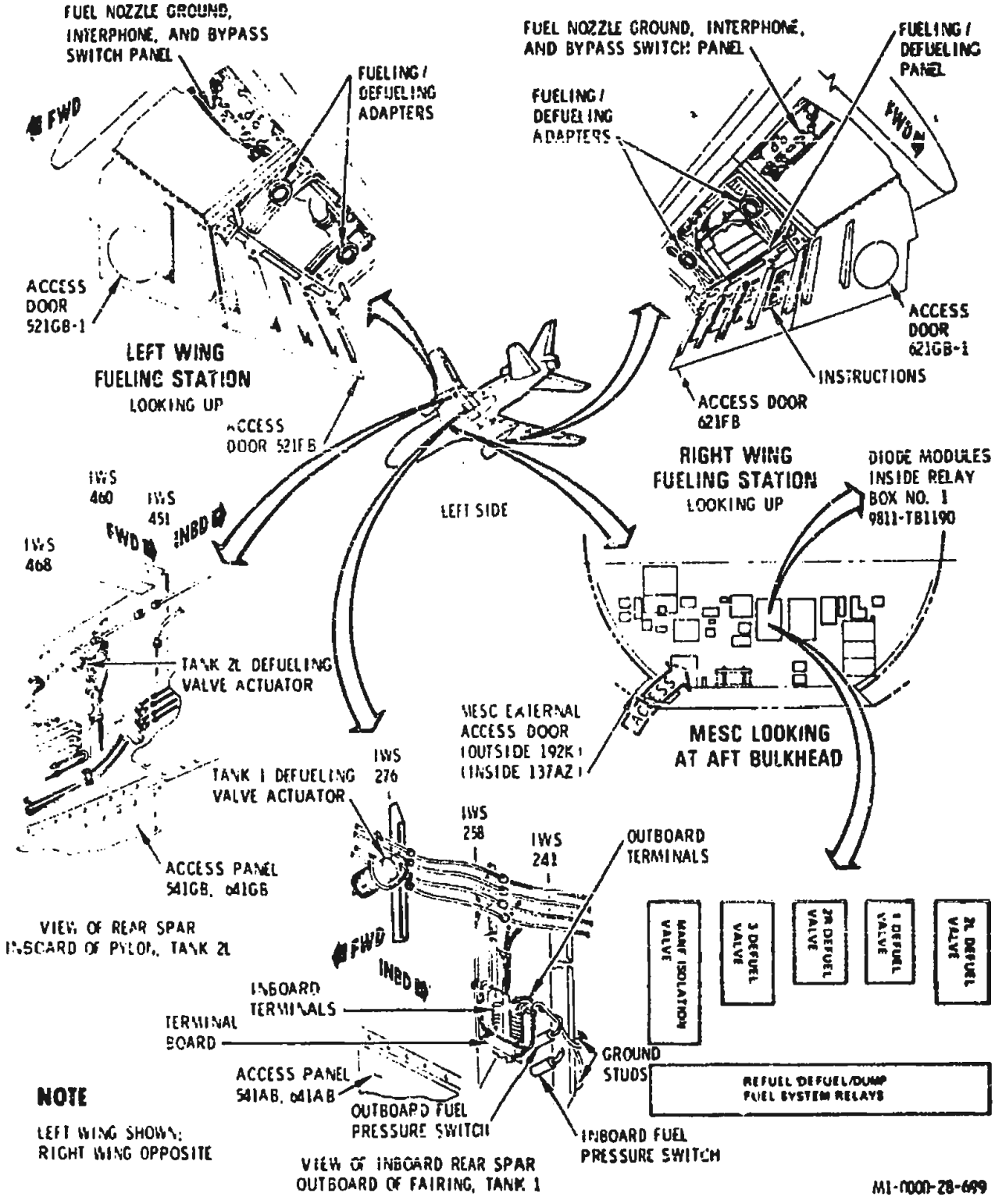
EFFECTIVITY: ALL

001B



R R Defuel System Component Locator
Figure 102

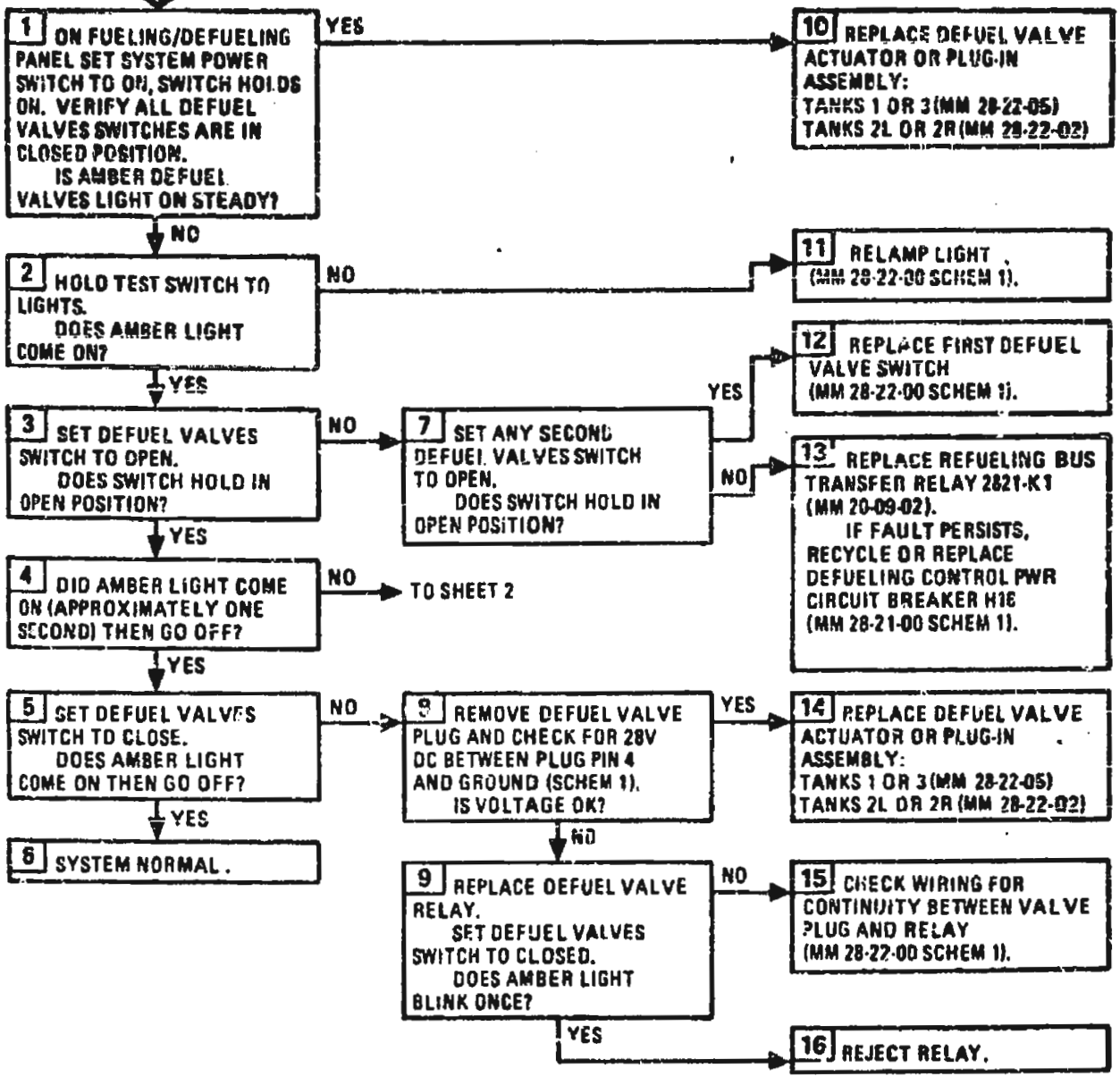
R R 001B EFFECTIVITY: 001-023



Defuel System Component Locator
Figure 102

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: C83-U3, U11, U12 (AIRCRAFT 001-031)
C83-U2, U11, U12 (AIRCRAFT 032-999)
GALLEY LEFT: S21
GALLEY RIGHT: H16, H18, H16
GALLEY RIGHT: OPEN AND TAG G20

DEFUEL VALVE PROBLEMS

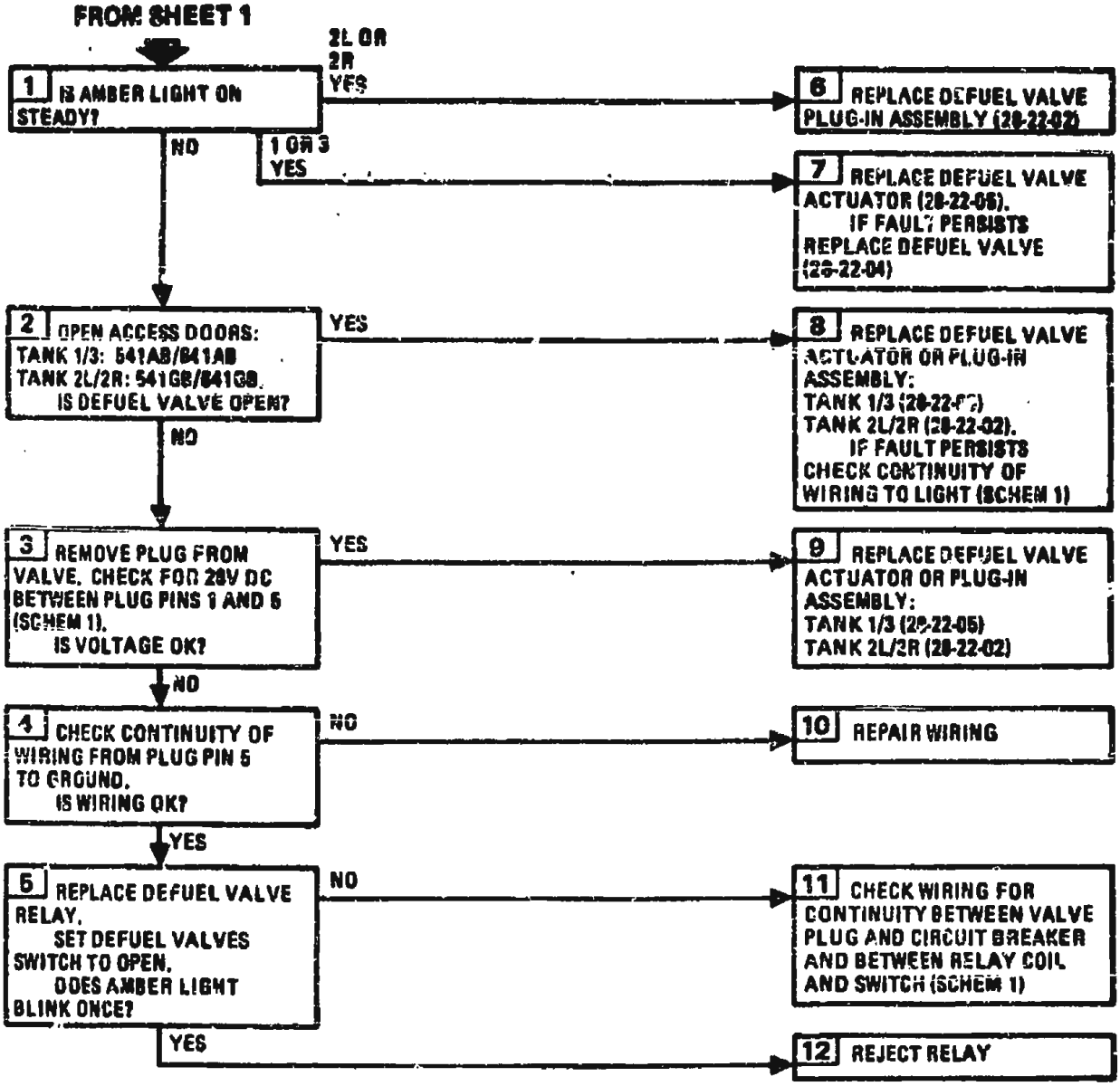

1 ON FUELING/DEFUELING PANEL SET SYSTEM POWER SWITCH TO ON, SWITCH HOLDS ON. VERIFY ALL DEFUEL VALVES SWITCHES ARE IN CLOSED POSITION. IS AMBER DEFUEL VALVES LIGHT ON STEADY?
YES
10 REPLACE DEFUEL VALVE ACTUATOR OR PLUG-IN ASSEMBLY: TANKS 1 OR 3 (MM 28-22-05) TANKS 2L OR 2R (MM 28-22-02)
NO
2 HOLD TEST SWITCH TO LIGHTS. DOES AMBER LIGHT COME ON?
NO
11 RELAMP LIGHT (MM 28-22-00 SCHEM 1).
YES
3 SET DEFUEL VALVES SWITCH TO OPEN. DOES SWITCH HOLD IN OPEN POSITION?
NO
7 SET ANY SECOND DEFUEL VALVES SWITCH TO OPEN. DOES SWITCH HOLD IN OPEN POSITION?
YES
12 REPLACE FIRST DEFUEL VALVE SWITCH (MM 28-22-00 SCHEM 1).
NO
13 REPLACE REFUELING BUS TRANSFER RELAY 2821-K1 (MM 20-09-02). IF FAULT PERSISTS, RECYCLE OR REPLACE DEFUELING CONTROL PWR CIRCUIT BREAKER H16 (MM 28-21-00 SCHEM 1).
YES
4 DID AMBER LIGHT COME ON (APPROXIMATELY ONE SECOND) THEN GO OFF?
NO
TO SHEET 2
YES
5 SET DEFUEL VALVES SWITCH TO CLOSE. DOES AMBER LIGHT COME ON THEN GO OFF?
NO
8 REMOVE DEFUEL VALVE PLUG AND CHECK FOR 28V DC BETWEEN PLUG PIN 4 AND GROUND (SCHEM 1). IS VOLTAGE OK?
YES
14 REPLACE DEFUEL VALVE ACTUATOR OR PLUG-IN ASSEMBLY: TANKS 1 OR 3 (MM 28-22-05) TANKS 2L OR 2R (MM 28-22-02)
YES
6 SYSTEM NORMAL.
NO
9 REPLACE DEFUEL VALVE RELAY. SET DEFUEL VALVES SWITCH TO CLOSED. DOES AMBER LIGHT BLINK ONCE?
NO
15 CHECK WIRING FOR CONTINUITY BETWEEN VALVE PLUG AND RELAY (MM 28-22-00 SCHEM 1).
YES
16 REJECT RELAY.

M1-0000-28-1658

R Defuel Valve Problems
R Figure 103 (Sheet 1)

EFFECTIVITY: ALL

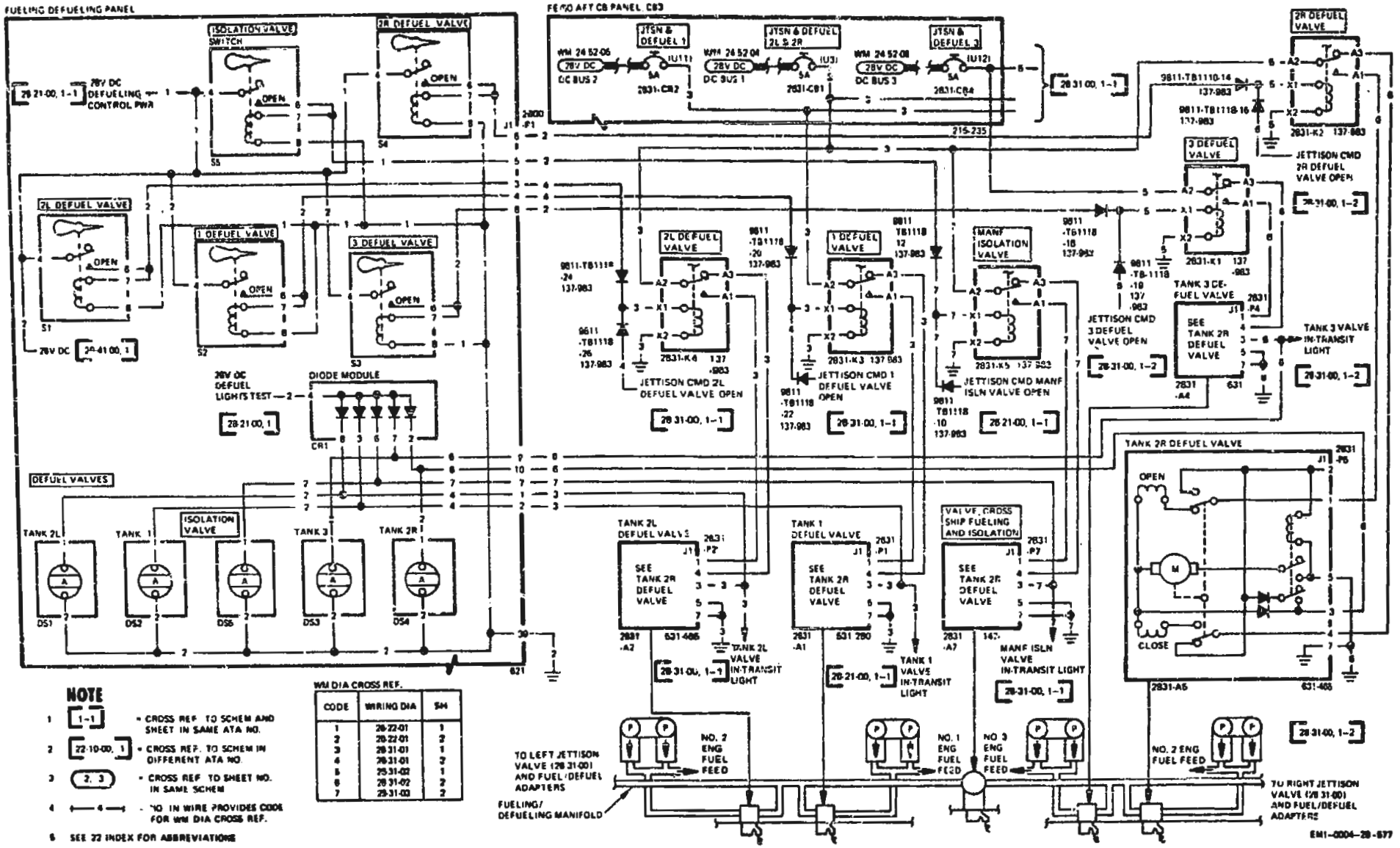
0013


FROM SHEET 1
1 IS AMBER LIGHT ON STEADY?
2L OR 2R YES
1 OR 3 YES
NO
6 REPLACE DEFUEL VALVE PLUG-IN ASSEMBLY (28-22-02)
7 REPLACE DEFUEL VALVE ACTUATOR (28-22-05). IF FAULT PERSISTS REPLACE DEFUEL VALVE (28-22-04)
2 OPEN ACCESS DOORS: TANK 1/3: 541AB/841AB TANK 2L/2R: 541GB/841GB. IS DEFUEL VALVE OPEN?
YES
NO
8 REPLACE DEFUEL VALVE ACTUATOR OR PLUG-IN ASSEMBLY: TANK 1/3 (28-22-05) TANK 2L/2R (28-22-02). IF FAULT PERSISTS CHECK CONTINUITY OF WIRING TO LIGHT (SCHEM 1)
3 REMOVE PLUG FROM VALVE. CHECK FOR 28V DC BETWEEN PLUG PINS 1 AND 5 (SCHEM 1). IS VOLTAGE OK?
YES
NO
9 REPLACE DEFUEL VALVE ACTUATOR OR PLUG-IN ASSEMBLY: TANK 1/3 (28-22-05) TANK 2L/2R (28-22-02)
4 CHECK CONTINUITY OF WIRING FROM PLUG PIN 5 TO GROUND. IS WIRING OK?
NO
10 REPAIR WIRING
YES
5 REPLACE DEFUEL VALVE RELAY. SET DEFUEL VALVES SWITCH TO OPEN. DOES AMBER LIGHT BLINK ONCE?
NO
11 CHECK WIRING FOR CONTINUITY BETWEEN VALVE PLUG AND CIRCUIT BREAKER AND BETWEEN RELAY COIL AND SWITCH (SCHEM 1)
YES
12 REJECT RELAY

M1-0101-28-782

R Defuel Valve Problems
R Figure 103 (Sheet 2)

R EFFECTIVITY: ALL
R
001B


FUELING DEFUELING PANEL
FE 70 AFT CB PANEL CB3
ISOLATION VALVE SWITCH
2R DEFUEL VALVE
2L DEFUEL VALVE
1 DEFUEL VALVE
3 DEFUEL VALVE
MANF ISOLATION VALVE
28V DC DEFUELING CONTROL PWR
28V DC DEFUEL LIGHTS TEST
DIODE MODULE
DEFUEL VALVES
TANK 2L
TANK 1
TANK 3
TANK 2R
ISOLATION VALVE
JTSN & DEFUEL 1
JTSN & DEFUEL 2L & 2R
JTSN & DEFUEL 3
DC BUS 2
DC BUS 1
DC BUS 3
JETTISON CMD 2L DEFUEL VALVE OPEN
JETTISON CMD 1 DEFUEL VALVE OPEN
JETTISON CMD MANF ISLN VALVE OPEN
JETTISON CMD 3 DEFUEL VALVE OPEN
JETTISON CMD 2R DEFUEL VALVE OPEN
TANK 3 DEFUEL VALVE
TANK 3 VALVE IN-TRANSIT LIGHT
TANK 2R DEFUEL VALVE
TANK 2L DEFUEL VALVE
TANK 1 DEFUEL VALVE
VALVE, CROSS SHIP FUELING AND ISOLATION
SEE TANK 2R DEFUEL VALVE
TANK 2L VALVE IN-TRANSIT LIGHT
TANK 1 VALVE IN-TRANSIT LIGHT
MANF ISLN VALVE IN-TRANSIT LIGHT
OPEN
CLOSE
NO. 2 ENG FUEL FEED
NO. 1 ENG FUEL FEED
NO. 3 ENG FUEL FEED
TO LEFT JETTISON VALVE (28-31-00) AND FUEL/DEFUEL ADAPTERS
FUELING/ DEFUELING MANIFOLD
TO RIGHT JETTISON VALVE (28-31-00) AND FUEL/DEFUEL ADAPTERS
EM1-0004-28-077

NOTE

1. [1-1] = CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2. [22-10-00, 1] = CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3. (2, 3) = CROSS REF. TO SHEET NO. IN SAME SCHEM
4. ←6→ = NO. IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.
5. SEE 22 INDEX FOR ABBREVIATIONS

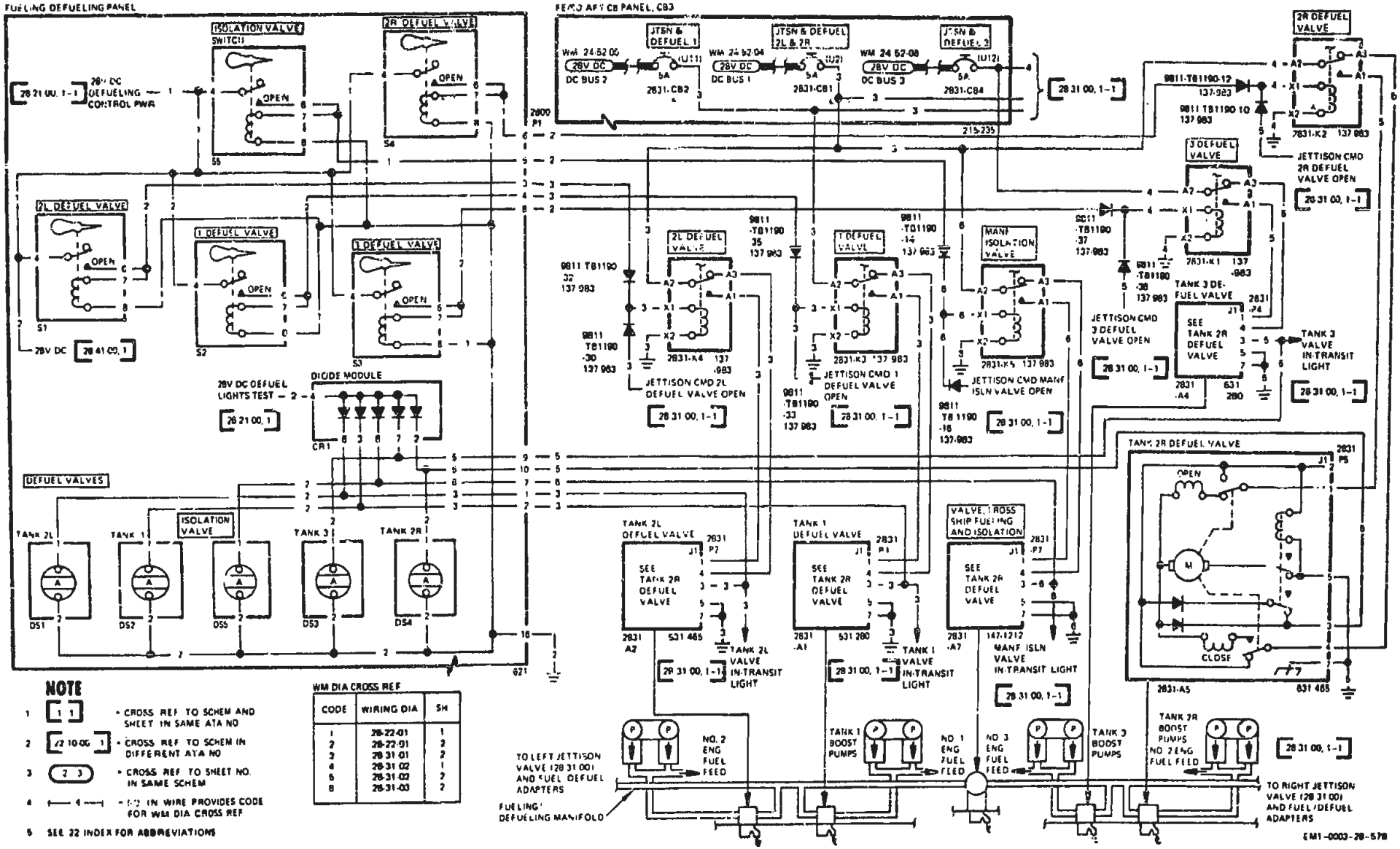
WM DIA CROSS REF.

CODE	WIRING DIA	S#4
1	28-22-01	1
2	28-22-01	2
3	28-31-01	1
4	28-31-01	2
5	28-31-02	1
6	28-31-02	2
7	28-31-03	2

R Defueling System Schematic
R SCHEM 1

EFFECTIVITY: 001-023

0018



NOTE

1. [1] • CROSS REF TO SCHEM AND SHEET IN SAME ATA NO
2. [22 10-06 1] • CROSS REF TO SCHEM IN DIFFERENT ATA NO
3. (2 3) • CROSS REF TO SHEET NO. IN SAME SCHEM
4. 1—4 • 1-2 IN WIRE PROVIDES CODE FOR WM DIA CROSS REF
5. SEE 22 INDEX FOR ABBREVIATIONS

WM DIA CROSS REF

CODE	WIRING DIA	SH
1	28-22-01	1
2	28-22-01	2
3	28-31-01	2
4	28-31-02	1
5	28-31-02	2
6	28-31-03	2

Defueling System Schematic
SCHEM 1

R EFFECTIVITY: 024-999
R
0018

DEFUELING - MAINTENANCE PRACTICES

1. General

Defueling (Ref. Para. 3A) is accomplished by connecting fueling/defueling hoses to adapters located in the left and right wing leading edge sections and applying suction pressure to the fueling/defueling manifold. DC motor-operated defueling valves installed between the engine fuel feed and fueling/defueling manifolds are then opened to permit withdrawal of fuel from the tanks through the boost pumps to the fueling/defueling manifold. The aircraft boost pumps are turned on to augment the suction pressure and increase the rate of fuel flow. Fuel crossfeed and fueling valves are left closed. Under maximum-rate defueling conditions, using two hoses at each fueling/defueling station, the fueling/defueling manifold isolation valve is closed. When using only the right or left wing fueling hose adapters, the valve is opened to permit cross-aircraft defueling. The defueling operation is controlled by operating applicable switches and monitoring fuel quantity indicators on the right wing fueling/defueling station panel (Ref. Fig. 201) and the fuel pressure and low-quantity warning lights on the Flight Engineer/Second Officers (FE/SO) FUEL SYSTEM panel. Defueling flow rate is a function of the suction applied at the fueling hose adapters. With four hoses attached, and all tanks being simultaneously defueled, the defueling flow rate, with a suction pressure of 10 psi at the nozzle adapters, is approximately 334 U.S. gallons (167 Imperial gallons) per minute. The defueling rate is increased to approximately 650 gallons per minute with the aircraft fuel boost pumps on. At the lower fuel tank levels, intermittent closing of the defueling valves allows time for the scavenge system to refill the boost pump surge boxes and results in a more thorough evacuation of fuel from the tank sump areas. Using this technique, all fuel can be evacuated from the tanks except for small puddles and approximately 2 gallons in the fuel pump boxes.

For maintenance purposes, fuel transfer between tanks (Ref. Para. 3B) is possible by appropriate sequencing of fueling and defueling valves.

2. Referenced Procedures

6-40-00	Exterior Access Doors and Panels
12-11-00	Servicing - Maintenance Practices
24-00-00	Electrical Power System - Maintenance Practices

28-11-00 Tanks - Maintenance Practices

28-23-00 Draining

28-27-00 Fuel Transfer - Maintenance Practices

3. Defueling

WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVING OPERATIONS IS STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF. 12-11-00 AND 28-11-00).

CR CR R CAUTION: IF BOOST PUMP CIRCUIT BREAKER TRIPS, DO NOT RESET UNTIL IT IS VERIFIED THAT CIRCUIT BREAKER TRIP IS NOT CAUSED BY MALFUNCTION IN BOOST PUMP ASSEMBLY.

A. Defueling Procedures

(1) On the galley right circuit breaker panel, zone 130, verify the following fuel system circuit breakers are closed:

FUEL SYS GA RPTR - IND (A15)

DEFUELING CONTROL PWR (H16)

FUELING VALVE TEST (H17)

FUELING VALVES (H18)

REFUEL PWR CONT (H19)

REFUEL ALTN POWER (G20)

On the left galley circuit breaker panel, zone 130, verify that circuit breaker DC BUS PWR REFUELING (B21) is closed.

On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, verify that the following FUEL SYSTEM circuit breakers are closed:

INBD PUMP IND (U2)

JTSN & DEFUEL 2L & 2R (U3)

OUTBD BOOST PUMP - 2L, 2R (U5, U6)

INBD BOOST PUMP - TANK 1, 2L, 2R, 3 (U7 through U10)

JTSN & DEFUEL 1, 3 (U11, U12)

OUTBD BOOST PUMP - 1, 3 and IND (U13 Through U15)

FUEL QTY IND - TEST, 1, 2L, 2R, and 3 (T1 through T5)

PASS SVCE BUS 1 L, R (Z9, Z10)

On Flight Engineer/Second Officers overhead circuit breaker panel CB2, zone 215, verify that the following circuit breakers are closed:

F/E IND LT TEST - 4 (H4)

IND LT - F/E PANEL - LOWER (J4)

On pilots overhead circuit breaker panel CB1, zone 210, verify that the FUEL SHUTOFF VALVE circuit breakers TANK 1, 2, and 3 (D10 through 12) are closed.

(2) Open right wing fueling/defueling station access door 621FB and 621GB-1 (Ref. 6-40-00) and establish interphone communication with Flight Engineer/Second Officers panel, zone 215. If defuel hoses are to be connected to left wing fueling/defueling adapters, also open access door 521FB and 521GB-1.

(3) At right wing fueling/defueling panel (Ref. Fig. 201), verify that all fueling and defueling valve switches are in the CLOSE position.

(4) Turn on aircraft electrical power (Ref. 24-00-00).

(5) On Flight Engineer/Second Officers FUEL SYSTEM panel, zone 215, verify that all crossfeed valves and engine tank valve switchlights are released and blue lights are off (all valves closed).

On FE/SO FUEL JETTISON panel verify that all fuel jettison valves switchlights are released and blue lights are off (valves closed).

(6) At fueling/defueling panel, place SYSTEM POWER switch in ON position. Verify the following:

(a) At fueling/defueling panel, all VALVE CLOSED and SET POINT TEST indicator lights come on.

NOTE: If aircraft is being defueled using only aircraft battery power, fuel quantity indicators will be inoperative.

(b) The panel service lights come on and the fuel quantity indicators are powered.

(c) The REFUEL POWER light on the Flight Engineer/Second Officers FUEL SYSTEM panel comes on and the fuel quantity indicators are powered.

(7) Hold LIGHTS switch in TEST position. Verify that ISOLATION VALVE and DEFUEL VALVES in-transit lights come on. (Five disagreement lights on FE/SO FUEL JETTISON panel also come on.)Release switch; lights go out.

(8) On fueling/defueling panel, verify that the fueling/defueling manifold isolation valve switch is in CLOSE position and ISOLATION VALVE light is out. If cross-ship defueling is being performed using only left or right wing fueling/defueling adapters, place ISOLATION VALVE switch in OPEN position. (ISOLATION VALVE light comes on while valve is in-transit, then goes out).

NOTE: If aircraft is being defueled using only aircraft battery power, the fueling/defueling manifold isolation valve must be manually opened.

(9) Ground defueling hose nozzle to aircraft on ground servicing fueling panel. Remove caps from fueling/defueling hose adapters and connect defueling hose nozzles. Rotate nozzles to locked position and actuate lever on each nozzle to open poppet valve in the adapter assembly.

(10) Start defueling facility pumping unit and apply 10 psig suction pressure to defueling hoses.

(11) At FE/SO FUEL SYSTEM panel depress TANK 2L, 1, 3, 2R PUMPS switchlights to turn on boost pumps.

(12) At fueling/defueling panel, place applicable DEFUEL VALVES switches in OPEN position. Verify that the switches remain latched in OPEN position and corresponding in-transit lights come on and then go out.

NOTE: If aircraft is being defueled using only aircraft battery power, the defueling valves must be manually opened.

(13) Verify fuel flow out of aircraft tanks by observing decrease in fuel quantity readings.

NOTE: When the fuel level in tank No. 2L and 2R inboard compartments has decreased to approximately 1000 lb, fuel begins to transfer by gravity flow from the outboard compartment through the float valve controlled low-level transfer manifold to the inboard compartment surge box. (This is in addition to fuel being constantly returned to the surge box by the scavenge system ejector pumps.) Defueling personnel must at this time be alert to a condition wherein fuel is being pumped out of the surge box at a greater rate than fuel entering through the transfer manifold and scavenge system ejector pumps. The resulting low fuel quantity in the surge box can cause boost pump cavitation and disruption of the defueling flow from that tank. The problem is overcome by closing the defueling valve for approximately 3 minutes and allowing the scavenge system to refill the surge box each time the boost pump low-pressure warning light (at the FE/SO station) starts to blink. The same condition exists for the inboard fuel tanks No. 1 and 3 at lower fuel levels. Intermittently closing the defueling valves until the scavenge ejector pumps refill the surge boxes results in a more thorough evacuation of fuel from the lower tank areas.

(14) At FE/SO panel, zone 215, monitor the LOW pressure warning lights in the boost pump switchlights.

(15) When a boost pump pressure LOW light starts to blink, immediately inform the mechanic at the fueling/defueling panel to close the defueling valve. Wait approximately three minutes for the surge box in that tank to refill (note increasing fuel quantity). Open the defueling valve and verify resumption of defueling flow. Monitor tank No. 1 and 3 fuel levels in the same manner, closing the defueling valve when the boost pump LOW pressure light starts to blink, and opening the valve when the surge box is refilled.

NOTE: With the fueling/defueling panel system power switch on, tank 2L and 2R LOW quantity lights

are inoperative and therefore, cannot be used as an indication of fuel depletion in the pump surge boxes.

(16) Continue procedures in preceding step until LOW pressure light comes on steady and there is no increase in fuel quantity when the defueling valve is closed. Close defueling valve and turn off aircraft boost pump.

(17) At fueling/defueling panel, close fueling/defueling manifold isolation valve, if open [Ref. Step 3A(8)].

(18) Place SYSTEM POWER switch in OFF position.

(19) Turn off defueling facility pumping unit.

(20) Actuate lever on defueling hose nozzle to close adapter poppet valve.

(21) Disconnect defueling hose nozzles and install adapter caps.

(22) Close fueling/defueling station access doors.

(23) Remove grounding wires between aircraft and defueling unit.

(24) Turn off electrical power (Ref. 24-00-00).

(25) Drain remaining fuel from tanks through the fuel condensate drain valves (Ref. 28-23-00).

B. Fuel Transfer (Tank to Tank)

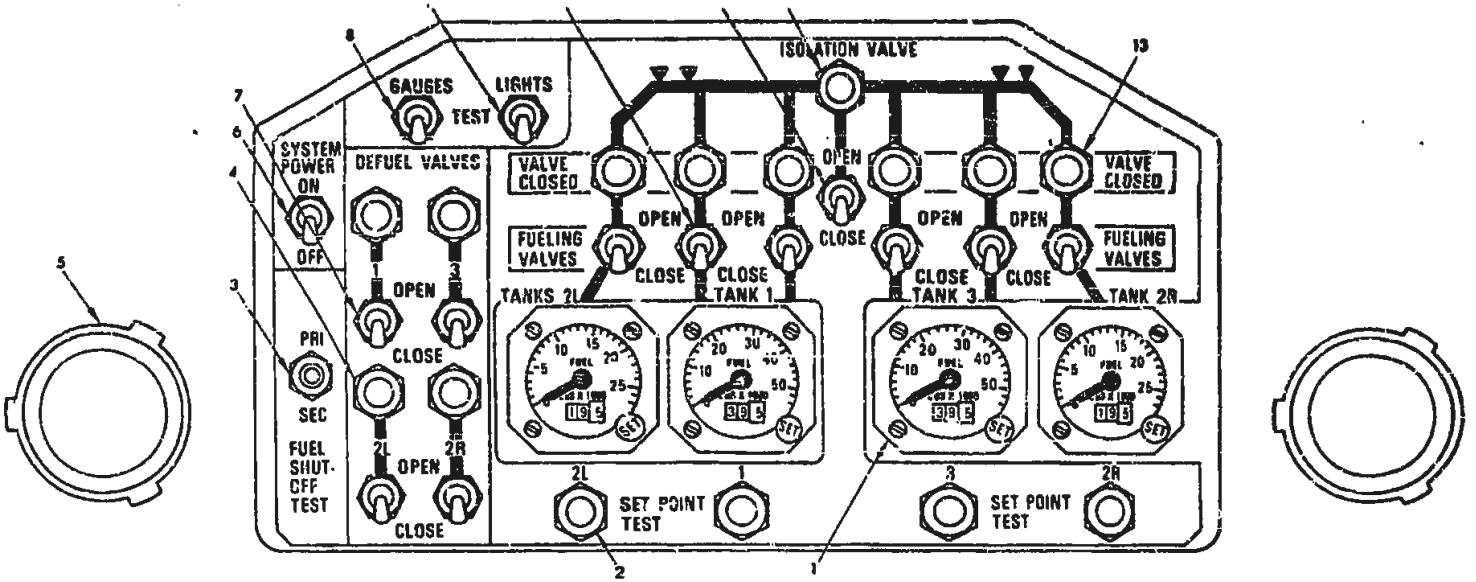
(1) At right and left wing fueling/defueling stations, zones 521/621, verify that fueling/defueling hose adapter caps are securely installed.

(2) Perform Steps 3A(1) through 3A(7).

NOTE: If fuel is being transferred using only aircraft battery power, the fueling/defueling manifold isolation valve and defuel valves must be manually opened.

(3) If fuel is to be transferred to tank in opposite wing, open fueling/defueling manifold isolation valve by placing ISOLATION VALVE switch on right fueling/defueling panel to OPEN position.

(4) Place DEFUEL VALVE switch of tank being defueled to OPEN position.



1 FUEL QUANTITY INDICATOR (4 PLACES)

- PROVIDES DIGITAL AND ANALOG INDICATION OF FUEL QUANTITY
- INCORPORATES SET POINT INDEX TO PERMIT SELECTION OF DESIRED FUEL QUANTITY. REFUELING IS AUTOMATICALLY TERMINATED WHEN INDICATOR POINTER REACHES INDEX SETTING. TERMINATION OF FUEL FLOW INTO TANK IS INDICATED WHEN CORRESPONDING SET POINT TEST LIGHT GOES OUT AND VALVE CLOSED LIGHT(S) COMES ON

2 SET POINT TEST LIGHT (4 PLACES)

- PROVIDES INDICATION OF AUTOMATIC SHUTOFF OF REFUELING FLOW. LIGHT GOES OUT WHEN INDICATOR POINTER PASSES SET POINT INDEX

3 FUEL SHUTOFF TEST SWITCH

- SWITCH IS DOUBLE-POLE DOUBLE-THROW MOMENTARY CONTACT TYPE WITH CENTER OFF POSITION
- PRIMARY AND SECONDARY POSITIONS SIMULATE FULL TANK CONDITION TO TEST AUTOMATIC FUEL SHUTOFF OPERATION. THE TEST VERIFIES OPERATION OF THE PRIMARY AND SECONDARY PILOT VALVES IN THE FUELING VALVES AND PRIMARY AND SECONDARY SWITCHES IN THE CORRESPONDING FUEL LEVEL CONTROL SWITCHES
- PROPER TEST RESULT IS INDICATED BY ALL VALVE CLOSED LIGHTS COMING ON

4 DEFUEL VALVES LIGHT (4 PLACES)

- LIGHT NORMALLY BLINKS ON, THEN OFF, WHEN VALVE IS IN-TRANSIT TO OPEN OR CLOSED POSITION. IF ON STEADY, VALVE IS NOT IN AGREEMENT WITH SWITCH POSITION

5 REFUEL/DEFUELING NOZZLE ADAPTER (2 PLACES)

- INCORPORATES PROVISIONS FOR ATTACHING STANDARD FUEL HOSE NOZZLES. TWO ADAPTERS ALSO LOCATED IN LEFT WING
- NOZZLE ATTACHMENT FLANGE IS DESIGNED TO BREAKAWAY IF PRE-DETERMINED CRITICAL FORCE IS APPLIED TO ADAPTERS THROUGH FUELING HOSES
- BROKEN NOZZLE ATTACHMENT FLANGES CAN BE REPLACED WITHOUT DISASSEMBLY. INTERNAL SPRING LOADED POPPET CLOSES ADAPTER PORT
- TWO REFUEL/DEFUELING NOZZLE ADAPTERS ARE ALSO LOCATED IN LEFT WING LEADING EDGE, ZONE 621 FB

6 SYSTEM POWER SWITCH

- CONTROLS APPLICATION OF ELECTRICAL POWER TO REFUEL/DEFUELING SYSTEM
- WHEN THE SWITCH IS ELECTRICALLY LATCHED IN ON POSITION, SERVICE PANEL LIGHTS COME ON, FUEL QUANTITY INDICATORS ARE POWERED, FUEL SHUTOFF TEST CIRCUIT IS ARMED, VALVE CLOSED INDICATOR LIGHTS COME ON, AND REFUEL POWER SWITCHLIGHT ON FLIGHT ENGINEER/SECOND OFFICERS FUEL SYSTEM PANEL COMES ON
- IF INADVERTENTLY LEFT ON, SYSTEM POWER SWITCH CAN BE UNLATCHED TO OFF POSITION BY DEPRESSING REFUEL POWER SWITCHLIGHT

7 DEFUEL VALVES SWITCH (4 PLACES)

- OPENS OR CLOSES DEFUELING VALVES

8 GAUGES TEST SWITCH

- WHEN HELD IN POSITION, SWITCH CHECKS OPERATION OF FUEL QUANTITY INDICATORS
- ALL FUEL QUANTITY INDICATORS DRIVE FULL UPSCALE
- CORRESPONDING SET POINT LIGHTS GO OUT
- ANY FUELING VALVE THAT IS OPEN WILL CLOSE
- SWITCH OPERATES IN PARALLEL WITH QTY TEST SWITCH ON FLIGHT ENGINEER/SECOND OFFICERS FUEL SYSTEM PANEL

9 INDICATOR LIGHTS TEST SWITCH

- TEST ON PANEL INDICATOR LIGHTS. ANY LIGHT NOT ALREADY ON WILL COME ON WHEN SWITCH IS HELD IN TEST POSITION

10 FUELING VALVE CONTROL SWITCH (6 PLACES)

- ARMS FUELING VALVE CIRCUIT FOR OPEN OPERATION
- FUEL PRESSURE IS REQUIRED TO OPEN FUELING VALVE

11 ISOLATION VALVE LIGHT

- LIGHT NORMALLY BLINKS ON, THEN OFF, WHEN VALVE IS IN-TRANSIT TO OPEN OR CLOSED POSITION. IF ON STEADY, VALVE IS NOT IN AGREEMENT WITH SWITCH POSITION

12 ISOLATION VALVE SWITCH

- OPENS REFUEL/DEFUELING MANIFOLD ISOLATION VALVE TO PERMIT REFUEL/DEFUELING OF ALL TANKS THROUGH ADAPTERS IN ONE WING ONLY
- PERMITS CROSS-SHIP TRANSFER OF FUEL BY MAINTENANCE PERSONNEL

13 FUELING VALVE POSITION LIGHT (6 PLACES)

- LIGHT IS ON WHEN CORRESPONDING FUELING VALVE IS CLOSED

M1-0005-28-166

R Fueling/Defueling Panel
R Figure 201

EFFECTIVITY: 001-024, 027

(5) Place FUELING VALVE switch of tank receiving fuel to OPEN position.

(6) At FE/SO FUEL SYSTEM panel, zone 215, turn on boost pumps in tank being defueled.

(7) Monitor transfer of fuel by observing decrease in fuel quantity of tank being defueled and increase in fuel quantity of tank receiving fuel. SET point knob may be adjusted to automatically terminate fuel flow into receiving tank at desired fuel quantity. If tank is to be completely defueled, follow procedures in Steps 3A(14) through 3A(16).

(8) Place FUELING VALVE switch of tank receiving fuel to CLOSE position.

(9) Place DEFUEL VALVE switch to CLOSE position.

(10) Place ISOLATION VALVE switch to CLOSE position (if applicable).

(11) Place SYSTEM POWER switch to OFF position.

(12) Turn off electrical power (Ref. 24-00-00).

(13) If tank is being completely defueled for tank entry, drain remaining fuel using condensate drain valves (Ref. 28-23-00).

DEFUELING - MAINTENANCE PRACTICES

The following procedures are applicable to L-1011-100/-200 aircraft having wing center section fuel tanks 1A and 3A.

1. General

Defueling (Ref. Para. 3A) is accomplished by connecting fueling/defueling hoses to adapters located in the left and right wing leading edge sections and applying suction pressure to the fueling/defueling manifold. DC motor-operated defueling valves installed between the engine fuel feed and fueling/defueling manifolds are then opened to permit withdrawal of fuel from the tanks through the boost pumps to the fueling/defueling manifold. The aircraft boost pumps are turned on to augment the suction pressure and increase the rate of fuel flow. Fuel crossfeed and fueling valves are left closed. Under maximum-rate defueling conditions, using two hoses at each fueling/defueling station, the fueling/defueling manifold isolation valve is closed. When using only the right or left wing fueling hose adapters, the valve is opened to permit cross-aircraft defueling. The defueling operation is controlled by operating applicable switches and monitoring fuel quantity indicators on the right wing fueling/defueling station panel (Ref. Fig. 201) and the fuel pressure and low-quantity warning lights on the Flight Engineer/Second Officers (FE/SO) FUEL SYSTEM panel. Simultaneous defueling of all tanks can be performed at a minimum rate of 200 gallons per minute using the defueling facility pumping unit and a suction pressure of 10 psig at the fueling/defueling hose adapters. The defueling rate is increased to a minimum rate of 650 gallons per minute with the aircraft fuel boost pumps on. At the lower fuel tank levels, intermittent closing of the defueling valves allows time for the scavenge system to refill the boost pump surge boxes and results in a more thorough evacuation of fuel from the tank sump areas. Using this technique, all fuel can be evacuated from the wing tanks except for small puddles and approximately 2 gallons in the fuel pump boxes.

Defueling wing center section tanks 1A and 3A is accomplished by using the normal tank 1A/3A to Tank 1/3 transfer system (Ref. 28-27-00) to transfer fuel into the corresponding wing tank. This method will leave approximately 4.5 gallons of undrained fuel in the tank, which may be drained through the tank condensate drain valves.

If the normal transfer system is inoperative, fuel in tanks 1A and 3A can be transferred to tanks 1/3 by opening the tank 1A/3A gravity transfer valves. This method leaves approximately 105 gallons of fuel that must be drained from the tank.

Wing center section tank fuel transfer must be terminated before the wing tanks can be completely emptied.

For maintenance purposes, fuel transfer between tanks (Ref. Para. 3B) is possible by appropriate sequencing of fueling and defueling valves.

2. Referenced Procedures

6-40-00	Exterior Access Doors and Panels
12-11-00	Servicing - Maintenance Practices
24-00-00	Electrical Power System - Maintenance Practices
28-11-00	Tanks - Maintenance Practices
28-23-00	Draining
28-27-00	Fuel Transfer - Maintenance Practices
32-63-00	Air/Ground Sensing - Maintenance Practices

3. Defueling

WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVING OPERATIONS IS STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF. 12-11-00 AND 28-11-00).

CR CR R CAUTION: IF BOOST PUMP CIRCUIT BREAKER TRIPS, DO NOT RESET UNTIL IT IS VERIFIED THAT CIRCUIT BREAKER TRIP IS NOT CAUSED BY MALFUNCTION IN BOOST PUMP ASSEMBLY.

A. Defueling Procedures

(1) On the galley right circuit breaker panel, zone 130, verify that the following fuel system circuit breakers are closed:

FUEL SYS GA RPTR - IND (A15)

DEFUELING CONTROL PWR (H16)

FUELING VALVE TEST (H17)

FUELING VALVES (H18)

REFUEL PWR CONT (H19)

REFUEL ALTN POWER (G20)

On the left galley circuit breaker panel, zone 130, verify that circuit breaker DC BUS PWR REFUELING (B21) is closed.

On FE/SO aft circuit breaker panel CB3, zone 215, verify that the following FUEL SYSTEM circuit breakers are closed:

INBD PUMP IND (U1)

JTSN & DEFUEL 2L and 2R (U2)

OUTBOARD BOOST PUMP - 2L, 2R (U3, U4)

SCAVENGE VALVE - TANK 1 & 1A, 3 & 3A (U5, U6)

INBD BOOST PUMP - TANK - 1, 2L, 2R, and 3 (U7 through U10)

JTSN & DEFUEL 1, 3(U11, U12)

OUTBD BOOST PUMP - 1, 3, and IND (U13 through U15)

SCAVENGE VALVE TANK 1A & 3A (U16)

FUEL QTY IND - TEST, 1, 2L, 2R, and 3 (T1 through T5)

PASS SVCE BUS 1 L, R (Z9, Z10)

On FE/SO overhead circuit breaker panel CB2, zone 215, verify that the following circuit breakers are closed:

F/E IND LT TEST - 4 (H4)

IND LT - F/E PANEL - LOWER (J4)

On pilots overhead circuit breaker panel CB1, zone 210, verify that GRAVITY FEED VALVE - tank 1A, 3A (H14, H15) circuit breakers are closed.

(2) Open right wing fueling/defueling station access door 621FB and 621GB-1 (Ref. 6-40-00) and establish interphone communication with Flight Engineer/Second Officers panel, zone 215. If defuel hoses are to be connected to left wing fueling/defueling adapters, also open access door 521FB and 521GB-1.

(3) At right wing fueling/defueling panel (Ref. Fig. 201), verify that all FUELING VALVES and DEFUELING VALVES switches are in the CLOSE position.

(4) Turn on aircraft electrical power (Ref. 24-00-00).

(5) On FE/SO FUEL SYSTEM panel, zone 215, verify that all crossfeed valves, and engine tank valves switchlights are released and blue lights are out (all valves closed). On FE/SO FUEL JETTISON panel verify that all fuel jettison valves switchlights are released and blue lights are out (all valves closed).

(6) At fueling/defueling panel, place SYSTEM POWER switch in ON position. Verify the following:

(a) At fueling/defueling panel, all VALVE CLOSED and SET POINT TEST indicator lights come on.

NOTE: If aircraft is being defueled using only aircraft battery power, fuel quantity indicators on both FE/SO and fueling/defueling panel will be inoperative.

(b) The panel service lights come on and the fuel quantity indicators are powered.

(c) The REFUEL POWER ON switchlight on the FE/SO FUEL SYSTEM panel comes on and the fuel quantity indicators are powered.

(7) Hold LIGHTS switch in TEST position. Verify that ISOLATION VALVE and DEFUEL VALVES in-transit lights come on. (Five disagreement lights on FE/SO FUEL JETTISON panel also come on.) Release switch; lights go out.

(8) On fueling/defueling panel, verify that the fueling/defueling manifold isolation valve switch is in CLOSE position and ISOLATION VALVE light is out. If cross-ship defueling is being performed using only left or right wing fueling/defueling adapters, place ISOLATION VALVE switch in OPEN position. (ISOLATION VALVE light comes on while valve is in-transit, then goes out).

NOTE: If aircraft is being defueled using only aircraft battery power, the fueling/defueling manifold isolation valve must be manually opened.

(9) Ground defueling hose nozzle to aircraft on ground servicing fueling panel. Remove caps from fueling/defueling hose adapters and connect defueling hose nozzles. Rotate nozzles to locked position and actuate lever on each nozzle to open adapter assembly poppet valve.

(10) If external electrical power is connected to aircraft, simulate an in-air condition at left and right MLG air/ground sensors using aluminum artificial targets (Ref. 32-63-00).

NOTE: If aircraft is being defueled using only aircraft battery power, energize DC STBY BUS standby (Ref. 24-32-00) to provide power for tank 1A/3A gravity transfer valve operation.

(11) On FE/SO FUEL SYSTEM panel depress GRAVITY TRANSFER TANK 1A and 3A switchlights to open gravity transfer valves.

(12) Start defueling facility pumping unit and apply 10 psig suction pressure to defueling hoses. (This is not a mandatory requirement, however, it increases the rate of fuel flow from the aircraft to the defueling unit tank.)

(13) At FE/SO FUEL SYSTEM panel depress TANK 2L, 1, 3, and 2R PUMPS switchlights to turn on boost pumps.

(14) At fueling/defueling panel, place applicable DEFUEL VALVES switches in OPEN position. Verify that the switches remain latched in OPEN position and corresponding in-transit lights come on and then go off.

NOTE: If aircraft is being defueled using only aircraft battery power, the defueling valves must be manually opened.

(15) Verify fuel flow out of aircraft tanks by observing decrease in fuel quantity readings on fuel quantity indicators sight gages.

NOTE: When the fuel level in tank No. 2L and 2R inboard compartments has decreased to approximately 1000 lb, fuel begins to transfer by gravity flow from the outboard compartment through the float valve controlled low-level transfer manifold to the inboard compartment surge box. (This is in addition to fuel being constantly returned to the surge box by the

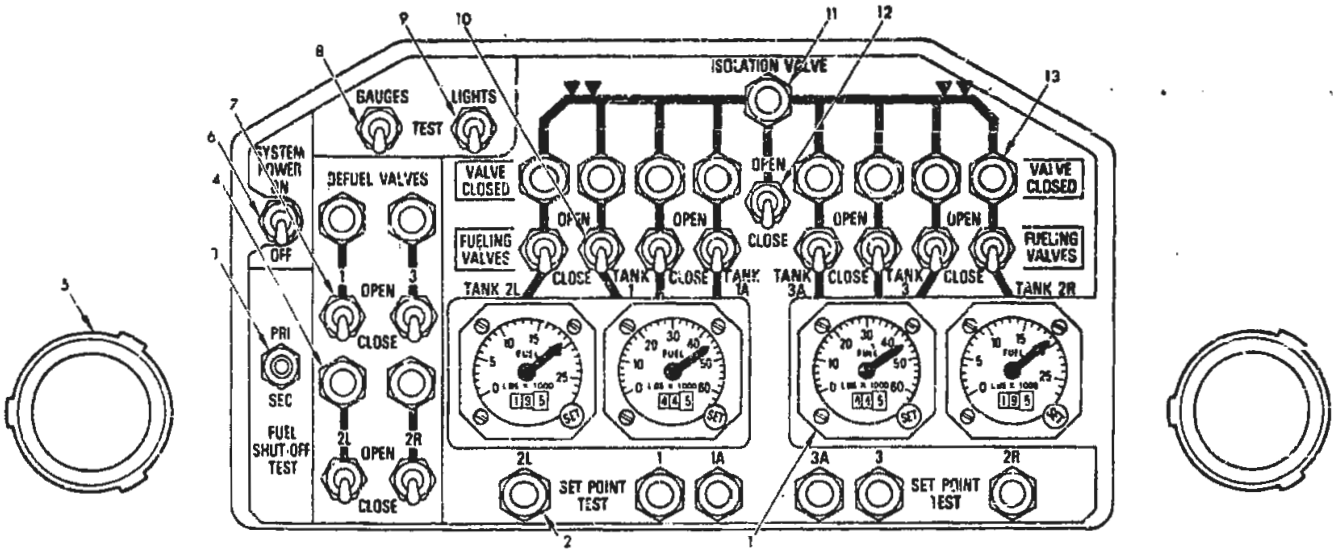
scavenge system ejector pumps.) Defueling personnel must at this time be alert to a condition wherein fuel is being pumped out of the surge box at a greater rate than fuel entering through the transfer manifold and scavenge system ejector pumps. The resulting low fuel quantity in the surge box can cause boost pump cavitation and disruption of the defueling flow from that tank. The problem is overcome by closing the defueling valve for approximately 3 minutes and allowing the scavenge system to refill the surge box each time the boost pump low-pressure warning light (at the FE/SO station) starts to blink. The same condition exists for the inboard fuel tanks No. 1 and 3 at lower fuel levels. Intermittently closing the defueling valves until the scavenge ejector pumps refill the surge boxes results in a more thorough evacuation of fuel from the lower tank areas.

(16) At FE/SO panel, zone 215, monitor the LOW pressure warning lights in the boost pump switchlights.

(17) When a boost pump pressure LOW light starts to blink, immediately inform the mechanic at the fueling/defueling panel to close the defueling valve. Wait approximately three minutes for the surge box in that tank to refill (note increasing fuel quantity). Open the defueling valve and verify resumption of defueling flow. Monitor tank No. 1 and 3 fuel levels in the same manner, closing the defueling valve when the boost pump LOW pressure light starts to blink, and opening the valve when the surge box is refilled.

NOTE: If center section tanks are being defueled with the normal tank (scavenging) transfer system operating close the tank 1A and 3A gravity transfer valves and complete defueling of these tanks using the normal tank 1A/3A to tank 1/3 fuel transfer system. Maintain a minimum of 1000 lbs (500 Kgs) of fuel in tanks 1 and 3 until tanks 1A and 3A are defueled. This will reduce the amount of residual fuel left in tanks 1A/3A to approximately 4.5 U.S. gallons.

With the fueling/defueling panel system power switch on, tank 2L, 1A, 3A, and 2R LOW quantity lights are inoperative and therefore, cannot be used as an indication of fuel depletion in the pump surge boxes or tanks.



1 FUEL QUANTITY INDICATOR (4 PLACES)

- PROVIDES DIGITAL AND ANALOG INDICATION OF FUEL QUANTITY (REF. 28-41-00).
- INCORPORATES SET POINT INDEX TO PERMIT SELECTION OF DESIRED FUEL QUANTITY. REFUELING IS AUTOMATICALLY TERMINATED WHEN INDICATOR POINTER REACHES INDEX SETTING. TERMINATION OF FUEL FLOW INTO TANK IS INDICATED WHEN CORRESPONDING SET POINT TEST LIGHT GOES OFF AND VALVE CLOSED LIGHT COMES ON (REF. 28-21-00)

2 SET POINT TEST LIGHT (6 PLACES) (REF. 28-21-00)

- PROVIDES INDICATION OF AUTOMATIC SHUTOFF OF FUELING FLOW. LIGHT GOES OFF WHEN INDICATOR POINTER PASSES SET POINT INDEX (REF. 28-21-00)

3 FUEL SHUTOFF TEST SWITCH (REF. 28-21-00)

- SWITCH IS DOUBLE-POLE DOUBLE-THROW MOMENTARY CONTACT TYPE WITH CENTER OFF POSITION
- PRIMARY AND SECONDARY POSITIONS SIMULATE FUEL TANK CONDITION TO TEST AUTOMATIC FUEL SHUTOFF OPERATION. THE TEST VERIFIES OPERATION OF THE PRIMARY AND SECONDARY PILOT VALVES IN THE FUELING VALVES AND PRIMARY AND SECONDARY SWITCHES IN THE CORRESPONDING FUEL LEVEL CONTROL SWITCHES
- PROPER TEST RESULT IS INDICATED BY ALL VALVE CLOSED LIGHTS COMING ON

4 DEFUEL VALVES LIGHT (4 PLACES) (REF. 28-22-00)

- LIGHT NORMALLY BLINKS ON, THEN OFF WHEN VALVE IS IN-TRANSIT TO OPEN OR CLOSED POSITION. IF ON STEADY, VALVE IS NOT IN AGREEMENT WITH SWITCH POSITION

5 FUELING/DEFUELING NOZZLE ADAPTER (2 PLACES) (REF. 28-21-00)

- INCORPORATES PROVISIONS FOR ATTACHING STANDARD FUEL HOSE NOZZLES
- NOZZLE ATTACHMENT FLANGE IS DESIGNED TO BREAKAWAY IF PRE-DETERMINED CRITICAL FORCE IS APPLIED TO ADAPTERS THROUGH FUELING HOSES
- BROKEN NOZZLE ATTACHMENT FLANGES CAN BE REPLACED WITHOUT DISASSEMBLY. INTERNAL SPRING LOADED POPPET CLOSES ADAPTER PORT
- TWO FUELING/DEFUELING NOZZLE ADAPTERS ARE ALSO LOCATED IN LEFT WING LEADING EDGE, ZONE 521 FB

6 SYSTEM POWER SWITCH (REF. 28-21-00)

- CONTROLS APPLICATION OF ELECTRICAL POWER TO FUELING/DEFUELING SYSTEM
- WHEN THE SWITCH IS ELECTRICALLY LATCHED IN ON POSITION, SERVICE PANEL LIGHTS COME ON, FUEL QUANTITY INDICATORS ARE POWERED, FUEL SHUTOFF TEST CIRCUIT IS ARMED, VALVE CLOSED INDICATOR LIGHTS COME ON, AND REFUEL POWER SWITCHLIGHT ON FLIGHT ENGINEER SECOND OFFICERS FUEL SYSTEM PANEL COMES ON
- IF INADVERTENTLY LEFT ON, SYSTEM POWER SWITCH CAN BE UNLATCHED TO OFF POSITION BY DEPRESSING REFUEL POWER SWITCHLIGHT

7 DEFUEL VALVES SWITCH (4 PLACES) (REF. 28-22-00)

- OPENS OR CLOSES DEFUELING VALVES

8 GAUGES TEST SWITCH (REF. 28-41-00)

- WHEN HELD IN POSITION, SWITCH CHECKS OPERATION OF FUEL QUANTITY INDICATORS
- ALL FUEL QUANTITY INDICATORS DRIVE FULL UPSCALE
- CORRESPONDING SET POINT LIGHTS GO OUT
- ANY FUELING VALVE THAT IS OPEN WILL CLOSE
- SWITCH OPERATES IN PARALLEL WITH QUANTITY TEST SWITCH ON FLIGHT ENGINEER/SECOND OFFICERS FUEL SYSTEM PANEL

9 INDICATOR LIGHTS TEST SWITCH (REF. 28-21-00)

- TESTS PANEL INDICATOR LIGHTS. ANY LIGHT NOT ALREADY ON WILL COME ON WHEN SWITCH IS HELD IN TEST POSITION

10 FUELING VALVE CONTROL SWITCH (8 PLACES) (REF. 28-21-00)

- ARMS FUELING VALVE CIRCUIT FOR OPEN OPERATION
- FUEL PRESSURE IS REQUIRED TO OPEN FUELING VALVE

11 ISOLATION VALVE LIGHT (REF. 28-21-00)

- LIGHT NORMALLY BLINKS ON, THEN OFF, WHEN VALVE IS IN-TRANSIT TO OPEN OR CLOSED POSITION. IF ON STEADY, VALVE IS NOT IN AGREEMENT WITH SWITCH POSITION

12 ISOLATION VALVE SWITCH (REF. 28-21-00)

- OPENS FUELING/DEFUELING MANIFOLD ISOLATION VALVE TO PERMIT FUELING/DEFUELING OF ALL TANKS THROUGH ADAPTERS IN ONE WING ONLY
- PERMITS CROSS-SHIP TRANSFER OF FUEL BY MAINTENANCE PERSONNEL

13 FUELING VALVE POSITION LIGHT (8 PLACES) (REF. 28-21-00)

- LIGHT IS ON WHEN CORRESPONDING FUELING VALVE IS CLOSED

M1-2x001-28-1

Fueling/Defueling Panel
Figure 201

R EFFECTIVITY: 025-026, 028-999
R
0028

(18) Continue procedures in preceding step until LOW pressure light comes on steady and there is no increase in fuel quantity when the defueling valve is closed. Close defueling valves and turn off aircraft boost pump.

(19) At fueling/defueling panel, close fueling/defueling manifold isolation valve, if open [Ref. Step 3A(8)].

(20) Place SYSTEM POWER switch in OFF position.

(21) Turn off defueling facility pumping unit.

(22) Actuate lever on defueling hose nozzle to close adapter poppet valve.

(23) Disconnect defueling hose nozzles and install adapter caps.

(24) Close fueling/defueling station access doors.

(25) Remove grounding wires between aircraft and defueling unit.

CAUTION: BE SURE ALL ARTIFICIAL TARGETS ARE REMOVED FROM BOTH MLG AIR/GROUND SENSORS.

(26) Remove artificial target from MLG air/ground sensors.

(27) Turn off electrical power (Ref. 24-00-00).

(28) Drain remaining fuel from tanks through the fuel condensate drain valves (Ref. 28-23-00).

NOTE: If gravity transfer only was used to defuel tanks 1A and 3A there will be approximately 105 gallons in tank 1A and3A that must be drained.

B. Fuel Transfer (Tank to Tank)

(1) At right and left wing fueling/defueling stations, zones 521/621, verify that fueling/defueling hose adapter caps are securely installed.

(2) Perform Steps 3A(1) through 3A(7).

(3) If fuel is to be transferred to tank in opposite wing, open fueling/defueling manifold isolation valve by placing ISOLATION VALVE switch on right fueling/defueling panel to OPEN position.

(4) Place DEFUEL VALVE switch of tank being defueled to OPEN position.

(5) Place FUELING VALVE switch of tank receiving fuel to OPEN position.

(6) At FE/SO FUEL SYSTEM panel, zone 215, turn on boost pumps in tank being defueled.

(7) Monitor transfer of fuel by observing decrease in fuel quantity of tank being defueled and increase in fuel quantity of tank receiving fuel. SET point knob may be adjusted to automatically terminate fuel flow into receiving tank at desired fuel quantity. If tank is to be completely defueled, follow procedures in Steps 3A(16) through 3A(18).

(8) Place FUELING VALVE switch of tank receiving fuel to CLOSE position.

(9) Place DEFUEL VALVE switch to CLOSE position.

(10) Place ISOLATION VALVE switch to CLOSE position (if applicable).

(11) Place SYSTEM POWER switch to OFF position.

(12) Turn off electrical power (Ref. 24-00-00).

(13) If tank is being completely defueled for tank entry, drain remaining fuel using condensate drain valves (Ref. 28-23-00).

DEFUEL - JETTISON VALVE - MAINTENANCE PRACTICES

1. General

This procedure is concerned with the deactivation of the defuel-jettison valve installed in fuel tanks 1, 2L, 2R and 3.

2. Deactivation Procedures

NOTE: This deactivation procedure applies only when an aircraft is to be dispatched in accordance with the MEL.

A. Open and tag the applicable circuit breaker(s) on the FE/SO Aft Circuit Breaker Panel CB3:

Tank No. 1 - FUEL SYSTEM-JTSN DEFUEL 1 (U11)

Tank No. 2L/2R - FUEL SYSTEM-JTSN DEFUEL 2L & 2R (U3)

Tank No. 3 - FUEL SYSTEM-JTSN DEFUEL 3 (U12)

B. Install a warning placard on the FE/SO panel and the fueling/defueling panel, Zone 621, FUEL SYSTEM MAINTENANCE IN PROGRESS.

R C. Gain access to the affected defuel - jettison valve
R actuator/plug-in assembly as follows:

R Tank 1 Valve Actuator - Left wing access panel 541AB.

R Tank 2L Valve Plug-In Assembly - Left wing access panel
R 541GB.

R Tank 2R Valve Plug-in Assembly - Right wing access panel
R 641GB.

R Tank 3 Valve Actuator - Right wing access panel 641AB.

D. Move the actuator override lever on the affected valve(s) to the CLOSED position.

E. Close and secure the access panel(s) opened in Step C.

F. Remove placards installed in Step B.

G. Install placard on the FE/SO panel in the vicinity of the FUEL JETTISON panel, DEFUEL/JETTISON VALVE(S) IN TANK(S) (1, 2L, 2R, 3) INOPERATIVE.

H. Make appropriate entry in aircraft log book.

DEFUELING VALVE PLUG-IN ASSEMBLY (TANKS NO. 2L AND 2R) REMOVAL AND INSTALLATION

1. General

Tank 2L and 2R defueling valves have a housing containing a rotary sleeve secondary shutoff valve, an electrical actuator, and a plug-type primary shutoff valve. The actuator and primary shutoff valve may be replaced as an integral plug-in assembly. Rotation of the plug-in assembly, during removal, actuates the secondary shutoff valve to a position which shuts off the housing fuel inlet and outlet ports.

2. Equipment and Materials

Hand-held container

Grease, Fluorosilicone, Dow Corning FS1291, or equivalent

Preformed Packing (Ref. Fig. 401)

Lock-wire, Fed Spec QQ-W-390, 0.032-inch diameter, or equivalent

3. Referenced Procedure

24-00-00 Electrical Power System - Maintenance Practices

4. Removal/Installation

CAUTION: VALVE ASSEMBLIES MODIFIED BY SB28-062 HAVE A GOLD ANODIZED SPACER PLATE ATTACHED TO THE VALVE ROTOR COVER ASSY THAT SUPPORTS THE ACTUATOR. THE PLATE PREVENTS INWARD MOVEMENT OF TWO VALVE RETAINING PINS INSTALLED IN THE COVER AND IS REQUIRED ONLY ON UNITS HAVING A RED ANODIZED COVER ASSY. WHEN REPLACING A PLUG-IN UNIT HAVING A RED ANODIZED COVER, BE SURE THAT THE REPLACEMENT UNIT IS EQUIPPED WITH THE SPACER PLATE.

PLUG-IN UNITS HAVING A GOLD ANODIZED COVER ASSY HAVE STEPPED VALVE RETAINING PINS AND DO NOT REQUIRE THE SPACER PLATE.

A. Removal

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag circuit breaker:

JTSN & DEFUEL 2L & 2R (U2) or (U3)

(2) Gain access to defueling valve by opening wing access door 541GB or 641GB (Ref. Fig. 401).

(3) Disconnect electrical connector.

(4) Depress detent lever and rotate plug-in assembly 90 degrees counterclockwise. (Do not pull plug-in assembly out of valve body at this time.)

(5) Remove screw from drain bolt and drain trapped fuel into container. Reinstall screw and lock-wire.

(6) Pull actuator out of valve body.

B. Installation

(1) Verify that circuit breakers opened in Step 4A(1) are open and tagged.

(2) Install new preformed packing and lubricate with grease (Ref. Para. 2). (3) Align retaining pins with slots in valve body.

(4) Push plug-in assembly into valve body until it bottoms, then rotate 90 degrees clockwise. Verify detent lever is engaged in retaining slot.

(5) Attach electrical connector.

(6) Remove tags and close circuit breakers opened in Step 4A(1).

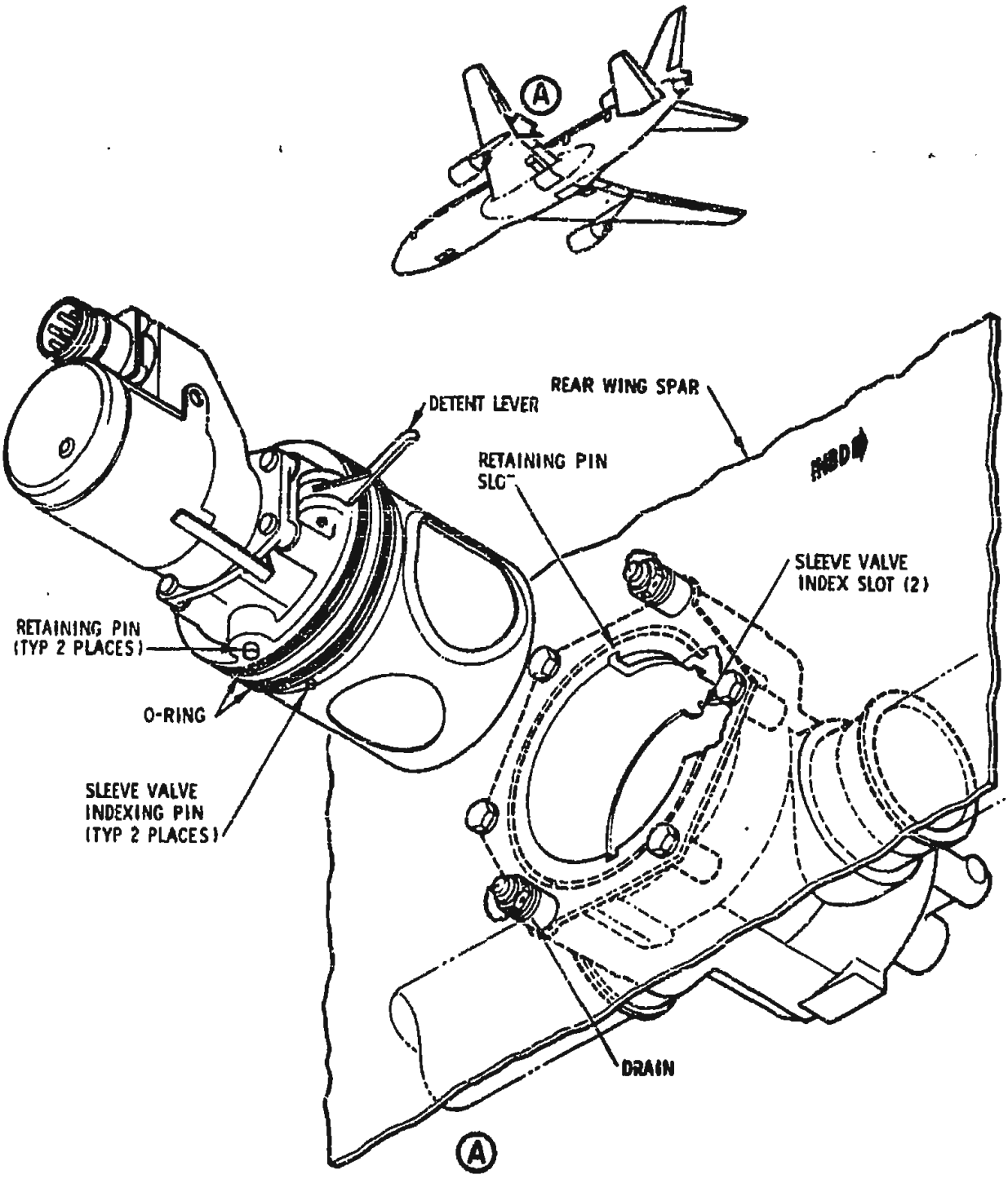
(7) Turn on electrical power (Ref. 24-00-00).

(8) At right wing fueling/defueling station, set SYSTEM POWER switch to ON. Verify switch holds in ON position.

(9) Set applicable tank 2L or 2R DEFUEL VALVES switch to open and then back to CLOSE position. Verify that corresponding indicator light comes on while valve is in transit. Have second man verify valve operation.

(10) Turn off electrical power (Ref. 24-00-00).

(11) Close access door.



Tank 2L/2R Defuel Valve
Figure 401

DEFUELING VALVE (TANKS 1 AND 3) - REMOVAL AND INSTALLATION

1. Equipment and Materials

Seal Washers (valve attach studs)

Packing (valve housing mounting surface)

Grease, Fluorosilicone, Dow Corning FS 1291, or equivalent

2. Referenced Procedures

6-40-00	Exterior Access Doors and Panels
28-11-00	Fuel Tanks - Maintenance Practices
28-20-01	WIG-O-FLEX Couplings - Maintenance Practices
28-22-00	Defueling - Maintenance Practices
28-22-05	Defueling Valve Actuator - Removal and Installation
28-26-00	Crossfeed System - Adjustment and Test

3. Removal/Installation

WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF. 28-11-00).

A. Removal

R (1) Defuel applicable tank (Ref. 28-22-00) or transfer fuel
R to another tank (Ref. 28-27-00).

R (2) On Flight Engineer/Second Officers aft circuit breaker
R panel, zone 215, open and tag all boost pump and defuel
R valve, circuit breakers (U2 through U15), and JTSN ARM
R circuit breaker (U18). Attach MAINTENANCE-IN-PROGRESS
R tag to FUEL SYSTEM panel.

R On fueling/defueling panel, zone 621, verify that
R system power switch is in OFF position. Attach
R MAINTENANCE-IN-PROGRESS tag.

R (3) Remove tank access door 531DB/631DB (Ref. 6-40-00).

R (4) Purge tank (Ref. 28-11-00).

R (5) Remove defueling valve actuator (Ref. 28-22-05).

R (6) Enter tank and dissasemble Wiggins couplings (Ref. 28-20-01) at defueling valve housing (Ref. Fig. 401).

R (7) Using plastic or phenolic scraper inside tank, carefully remove sealant fillet at housing-to-spar web faying surface.

R (8) Hold valve housing while second man in zone 541AB/641AB removes four housing attach studs, flat washers and seal washers.

R (9) Remove valve housing from aircraft.

B. Installation

R (1) Carefully clean spar web-to-valve housing contact
R surfaces (Ref. Fig. 401).

R (2) Lubricate and insert new preformed packing in housing
R flange.

R (3) Install new seal washer on each of four housing attach
R studs.

(4) While man in tank holds housing in its installed position, install four studs with flat washers and seal washers. (Seal washer must be between spar web and flat washer.)Tighten studs to standard torque value for 0.250-inch diameter bolt.

R (5) Apply fillet sealant around edge of housing mounting
R flange (Ref. 28-11-00, Para. 5).

R (6) Reassemble Wiggins couplings (Ref. 28-20-01).

R (7) Reinstall tank access covers.

R (8) Reinstall actuator (Ref. 28-22-05). If valve is not
R closed, move actuator override lever to CLOSED
R position.

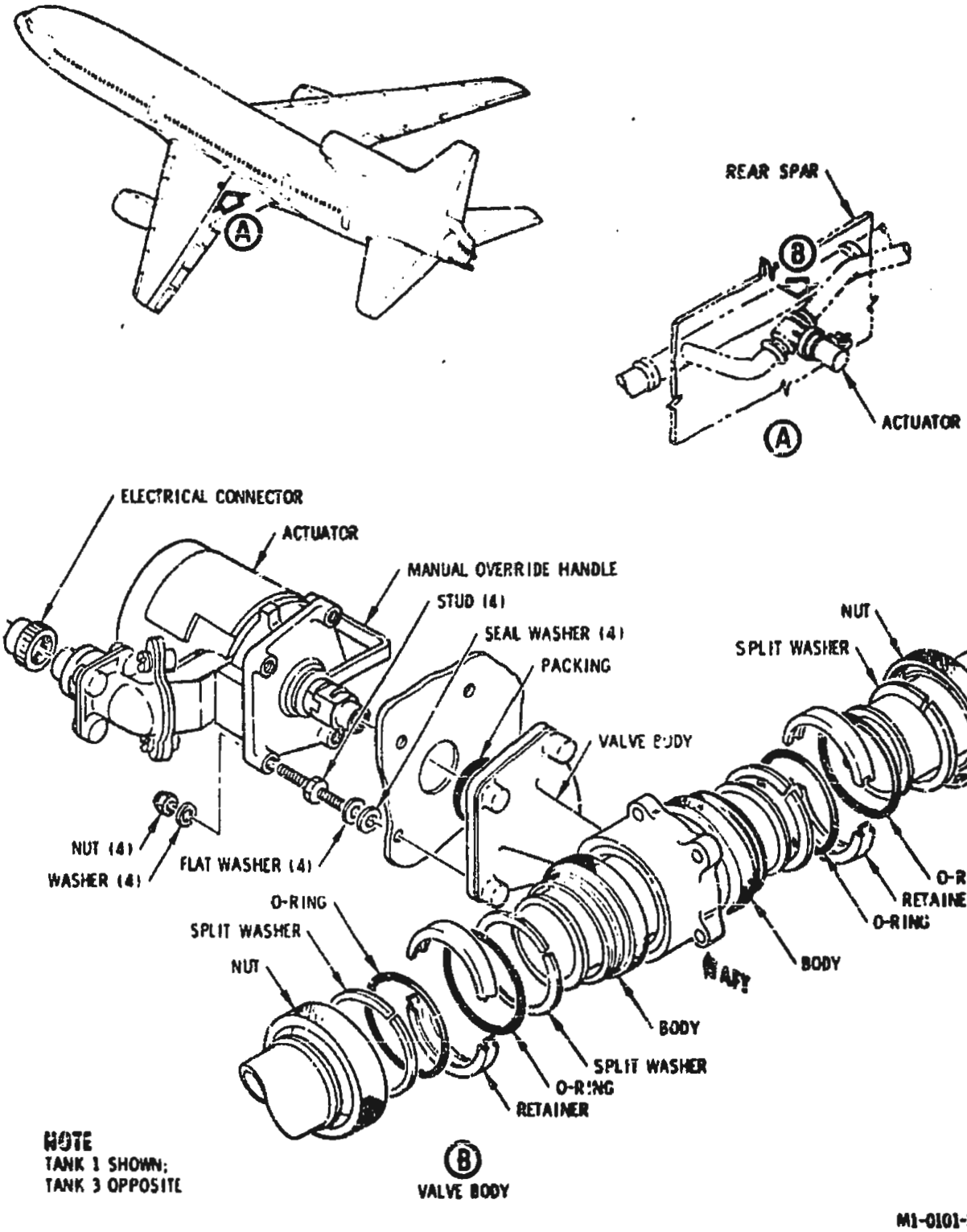
R (9) Allow time for fillet sealant to cure (Ref. 28-11-00).

R (10) Remove tags and close circuit breakers opened in Step
R 3A(2).

R (11) Refuel tank and check for fuel leaks at valve shaft and
R support studs.

R (12) Check operation of defueling valve by transferring a
R small quantity of fuel to another tank (Ref. 28-22-00).

R (13) Remove MAINTENANCE-IN-PROGRESS tags.



Defueling Valve - Tanks 1 and 3 - Removal and Installation
Figure 401

DEFUELING VALVE ACTUATOR (TANK NO. 1 AND 3) REMOVAL AND INSTALLATION

1. Equipment and Materials

   Retainer Pin (Ref. Fig. 401)

2. Referenced Procedures

6-40-00	External Access Doors and Panels - Maintenance Practices
24-00-00	Electrical Power System - Maintenance Practices

3. Removal/Installation

   A. Removal

R (1) On Flight Engineer/Second Officers aft circuit breaker
R panel CB3, zone 215, open and tag JTSN & DEFUEL 1 or 3 circuit breaker (U11 or U12).

   (2) Gain access to tank 1 or 3 defueling valve actuator (Ref. Fig. 401) by opening wing access door 541AB or 641AB (Ref. 6-40-00).

   (3) Disconnect electrical harness.

   (4) Note position of actuator manual override lever.

   (5) Remove actuator attach nuts and washers.

   (6) Separate actuator from tank wall.

   (7) Remove retainer pin from actuator shaft and remove adapter. Retain adapter for reinstallation.

   B. Installation

   (1) Verify that circuit breakers opened in Step 3A(1) are opened and tagged.

   (2) Verify that actuator position handle is in position noted in Step 3A(4).

   (3) Place adapter on actuator shaft and install new retainer pin. Bend retainer pin ends against adapter.

R R (4) Align actuator output shaft adapter with valve shaft, and mount actuator flange to support studs.

(5) Install actuator attach washers and nuts. Tighten nuts 15 to 20 lb in. higher than running torque.

R (6) Attach electrical harness.

(7) Remove tags and close circuit breakers opened in Step 3A(1).

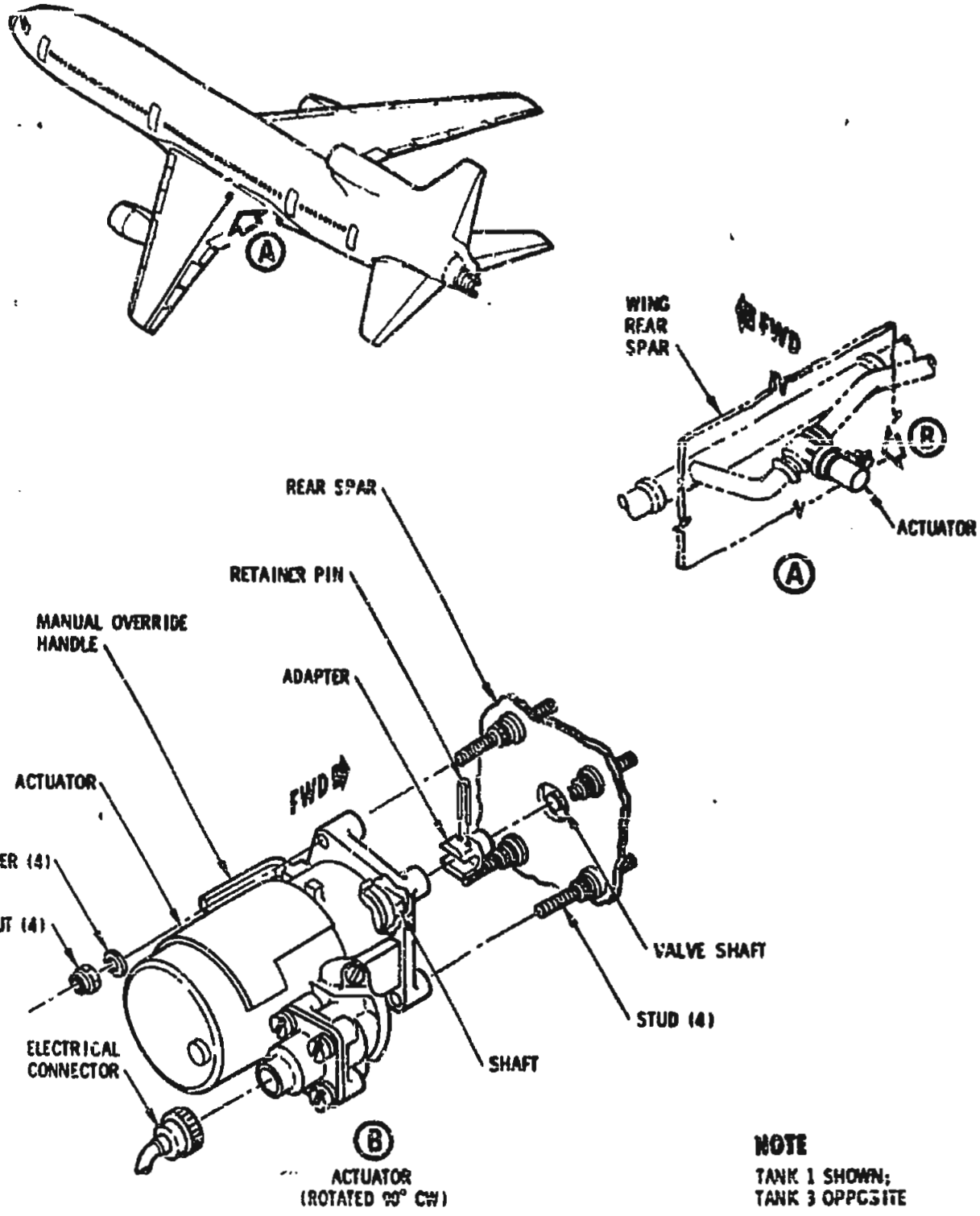
R (8) Apply external electrical power (Ref. 24-00-00).

R R R (9) At right wing fueling/defueling station set SYSTEM POWER switch to on. Verify switch holds in on position.

R R R R (10) Place applicable tank 1 or 3 DEFUEL VALVES switch to OPEN position. Verify that switch holds in open position. Verify that valve-in-transit light comes on (approximately one second) then goes out.

R R (11) Place switch to CLOSED position. Verify that valve-in-transit light comes on then goes out.

R R (12) Place system power switch to OFF position and close panel access door.



NOTE
TANK 1 SHOWN;
TANK 3 OPPOSITE

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R Defueling Valve Actuator - Tanks 1 and 3 - Removal and Installation
R Figure 401

R EFFECTIVITY: ALL
R
D01B

DRAINING - DESCRIPTION AND OPERATION

1. General

R Five fuel and condensate drain valves are installed in each wing
R lower surface; one in the outboard section of tanks 2L and 2R,
R two in the inboard sections of tank 2L and 2R, and two each in
R tanks 1 and 3. One of the drain valves in each tank is located
R in the surge box area next to the fuel boost pumps (Ref. Fig.
R 1).

R On aircraft having wing center section tanks, one additional
R condensate drain valve is installed in the lower surface of tank
R 1A and 3A. These valves are operated by probes which extend
R downward through fuel drain tubes to accessible locations below
R the fuselage.

R A fueling/defueling manifold drain valve in tank 1 and 3 allows fuel to drain from the manifold into the tank when the manifold is depressurized. Both left and right wing fueling/defueling manifolds are vented by orifice fittings located adjacent to the tank 2L/2R fuel level control switch assemblies.

2. Fuel and Condensate Drain Valves

A. Description and Operation

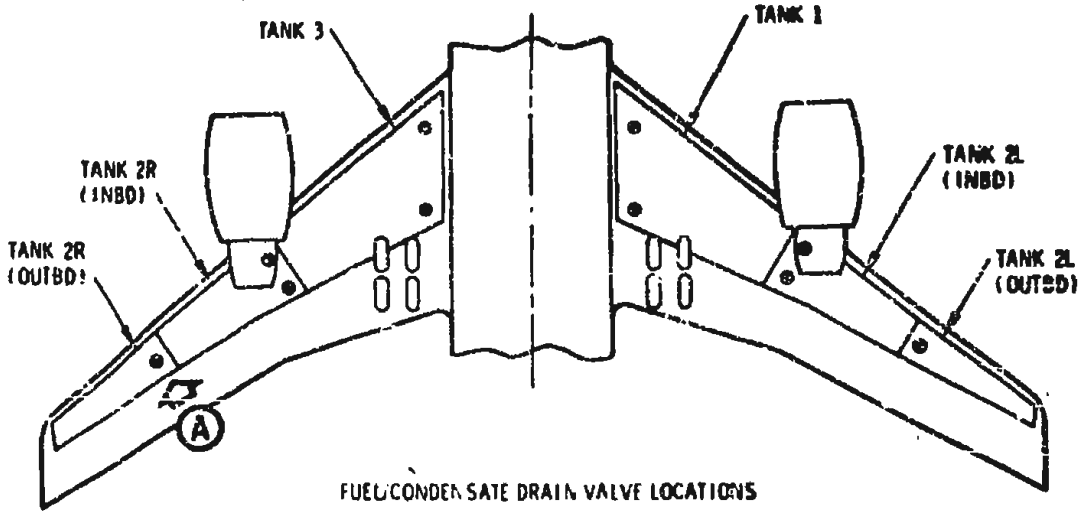
R Fuel and condensate drain valves (Ref. Fig 1) allow drainage
R of fuel and accumulated moisture from the tanks. They are
R opened when a primary poppet is unlocked and manually pushed
R upward to unseat the valve.

A secondary poppet in the wing tank valves prevent fuel leakage from the tank when the primary poppet is removed for seal replacement. Wing center section tank drain valves have a secondary seal which prevents fuel leakage from the
R tank during primary seal replacement.

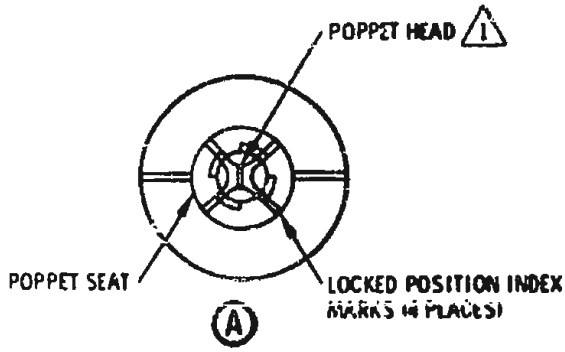
3. Fueling/Defueling Manifold Drain Valve

A. Description and Operation

Manifold drain valves installed in the tank No. 1 and 3 surge boxes drain the fueling/defueling manifold at the completion of fueling operations (Ref. Fig. 2). The valve is closed during fueling operations when manifold pressure exceeds 8.5 psi. When the manifold is depressurized, a



FUEL/CONDENSATE DRAIN VALVE LOCATIONS



WING TANK FUEL/CONDENSATE
DRAIN VALVE
(TYPICAL 10 PLACES)

1 TURN 30° CCW AND PUSH TO DRAIN
RELEASE PRESSURE AND TURN 30° CW
TO STOP DRAINING
POPPET HEAD IS IN LOCKED POSITION WHEN
FOUR TANGS ALIGN WITH INDEX MARKS
(AS SHOWN)

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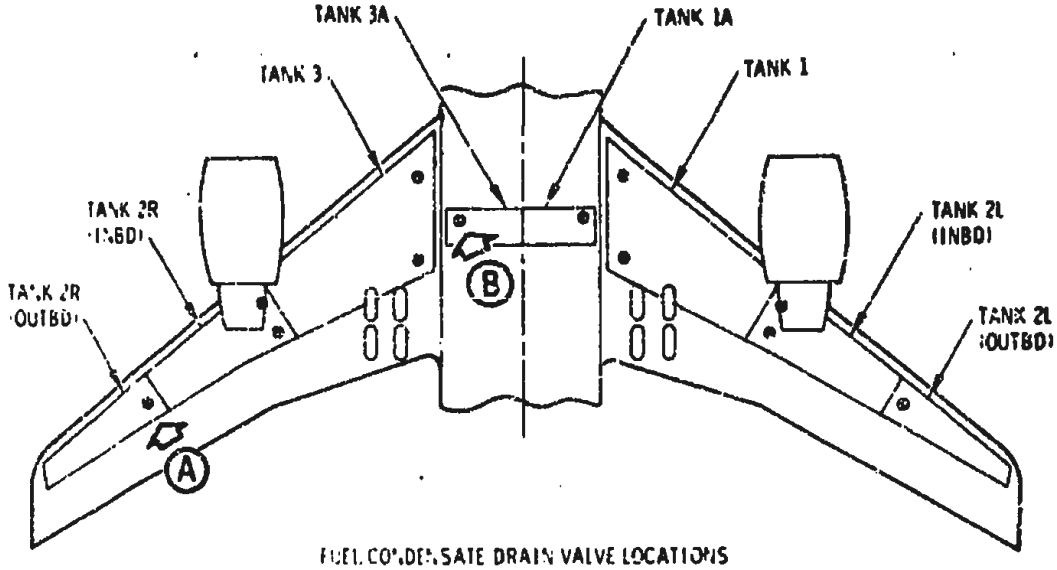
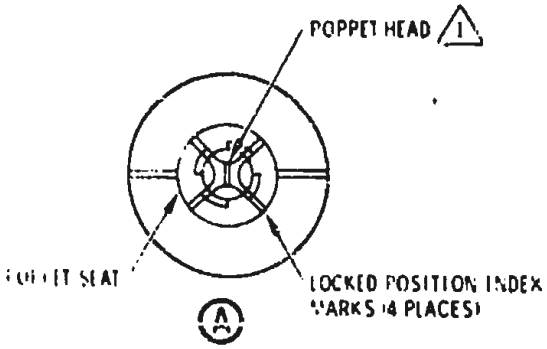
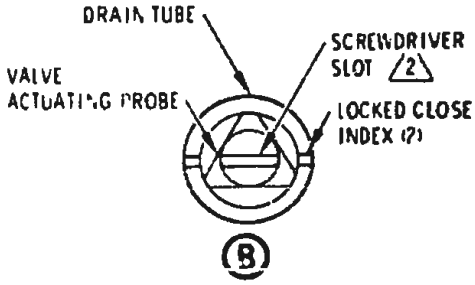
R
R Fuel and Condensate Drain Valve Locations
Figure 1



FUEL CONDENSATE DRAIN VALVE LOCATIONS



WING TANK FUEL CONDENSATE
DRAIN VALVE
(TYPICAL 10 PLACES)



TANK 1A/3A FUEL CONDENSATE
DRAIN VALVE
(TYPICAL 2 PLACES)

1 TURN 30° CCW AND PUSH TO DRAIN
RELEASE PRESSURE AND TURN 30° CW
TO STOP DRAINING
POPPET HEAD IS IN LOCKED POSITION WHEN
FOUR TABS ALIGN WITH INDEX MARKS
(AS SHOWN)

2 TURN PROBE 90 DEGREES AND
PUSH IN TO DRAIN
RELEASE PRESSURE AND TURN 90° TO
LOCKED POSITION TO STOP DRAINING
VALVE IS LOCKED CLOSED WHEN SLOT
AND INDEX MARKS LINE UP
(AS SHOWN)

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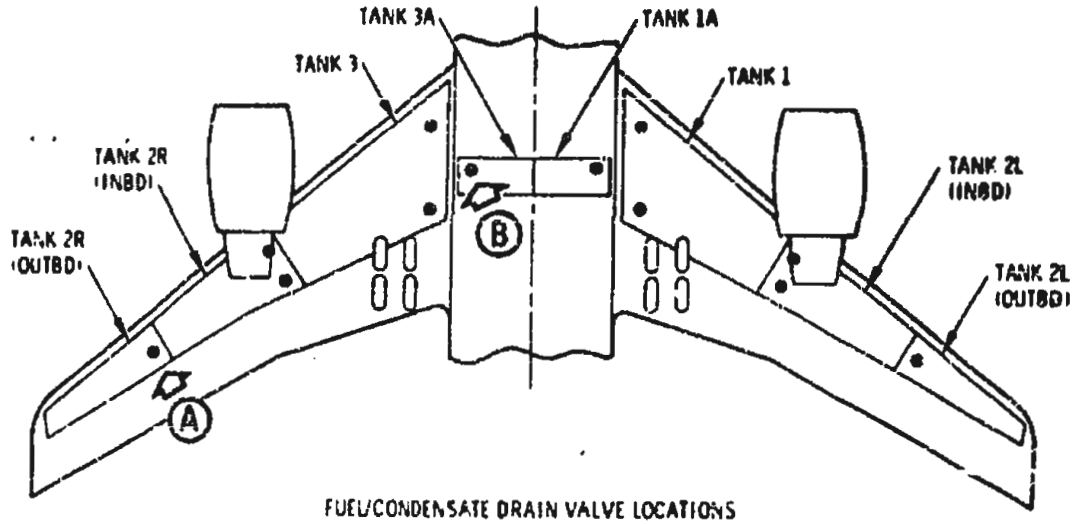
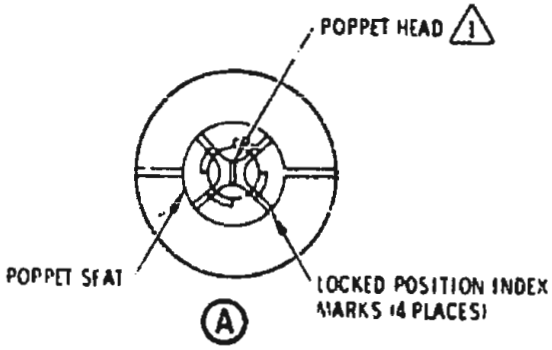
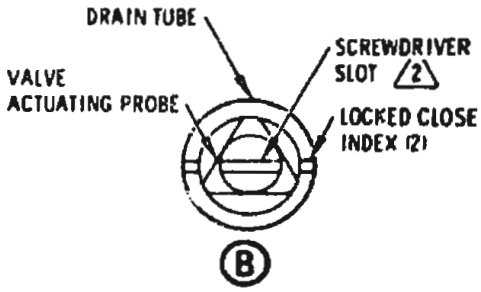
Fuel and Condensate Drain Valve Locations
Figure 1



FUEL/CONDENSATE DRAIN VALVE LOCATIONS



WING TANK FUEL CONDENSATE DRAIN VALVE (TYPICAL 10 PLACES)



TANK 1A/3A FUEL CONDENSATE DRAIN VALVE (TYPICAL 2 PLACES)

1 TURN 30° CCW AND PUSH TO DRAIN
RELEASE PRESSURE AND TURN 30° CW TO STOP DRAINING
POPPET HEAD IS IN LOCKED POSITION WHEN FOUR TANGS ALIGN WITH INDEX MARKS (AS SHOWN)

2 TO DRAIN - ROTATE SCREWDRIVER SLOT 90 DEGREES TO UNLOCK VALVE ACTUATING PROBE. PUSH UP TO STOP AND ROTATE 90 DEGREES TO LOCK VALVE IN OPEN POSITION

TO CLOSE - ROTATE SCREWDRIVER SLOT 90 DEGREES AND ALLOW SPRING FORCE TO EXTEND ACTUATING PROBE. ROTATE PROBE 90 DEGREES TO LOCK VALVE IN CLOSED POSITION

NOTE: VALVE IS IN LOCKED-OPEN AND LOCKED-CLOSED POSITIONS WHEN SCREWDRIVER SLOT IS ALIGNED WITH INDEX SLOTS IN DRAIN TUBE

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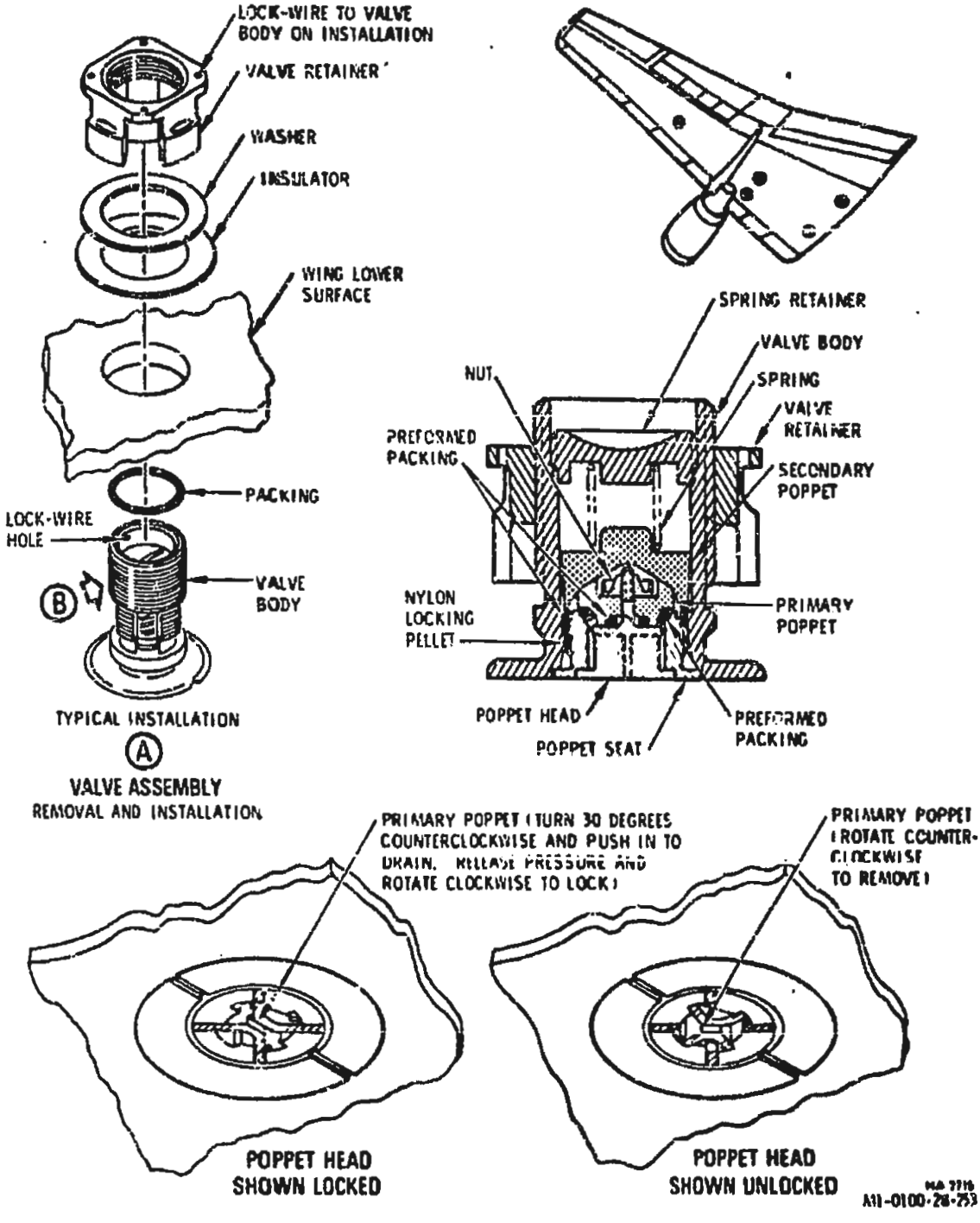
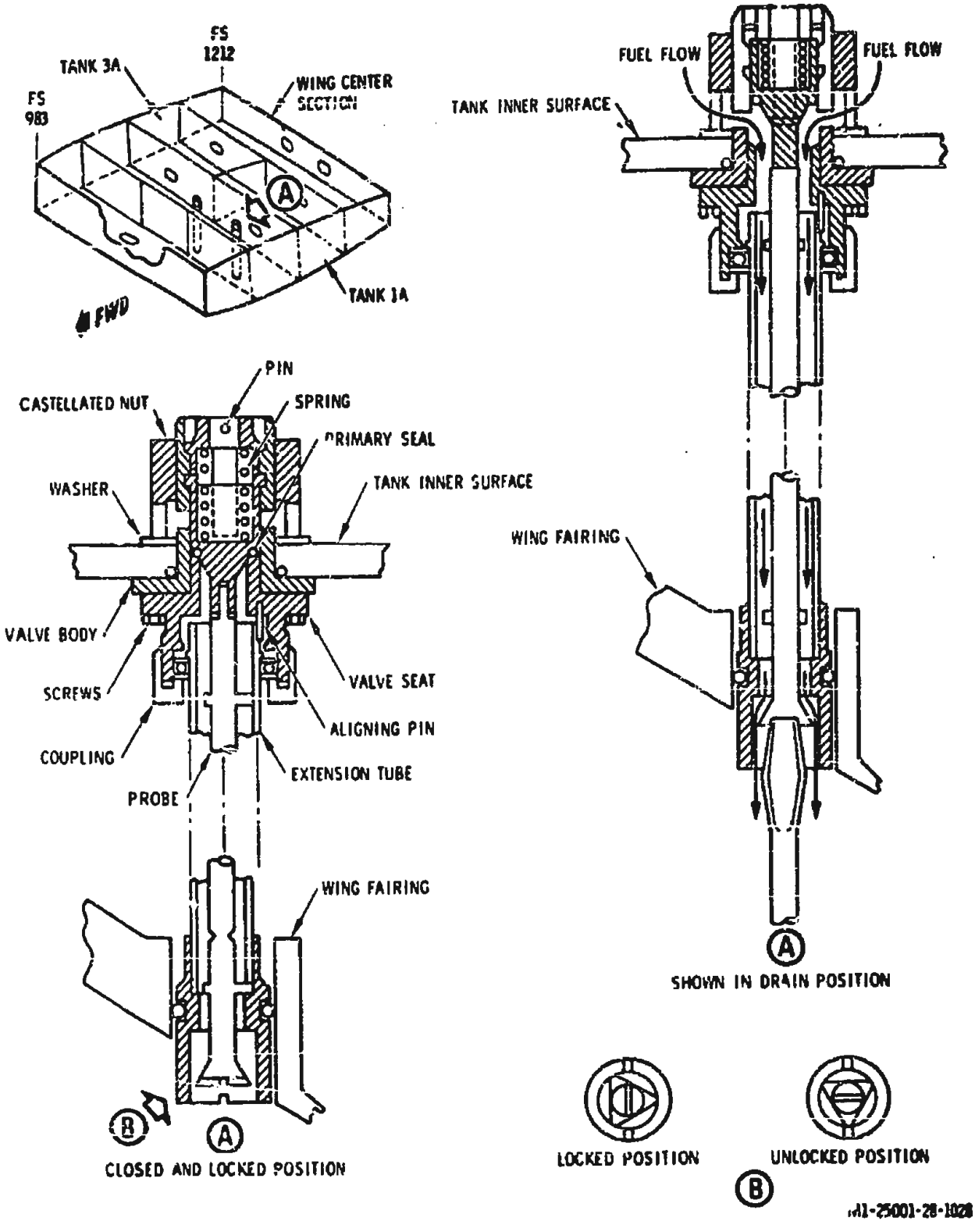
Fuel and Condensate Drain Valve Locations
Figure 1



Wing Tank Fuel and Condensate Drain Valve
Figure 2



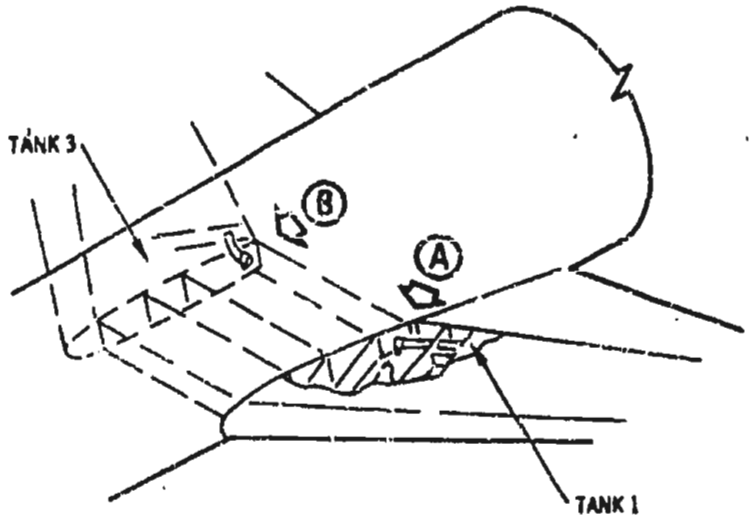
Tank 1A and 3A Fuel and Condensate Drain Valve
Figure 3

flapper valve in the valve housing cap closes to prevent re-entry of fuel into the manifold, from the tank.

4. Engine Fuel Feed Manifold Drains

A. Description and Operation

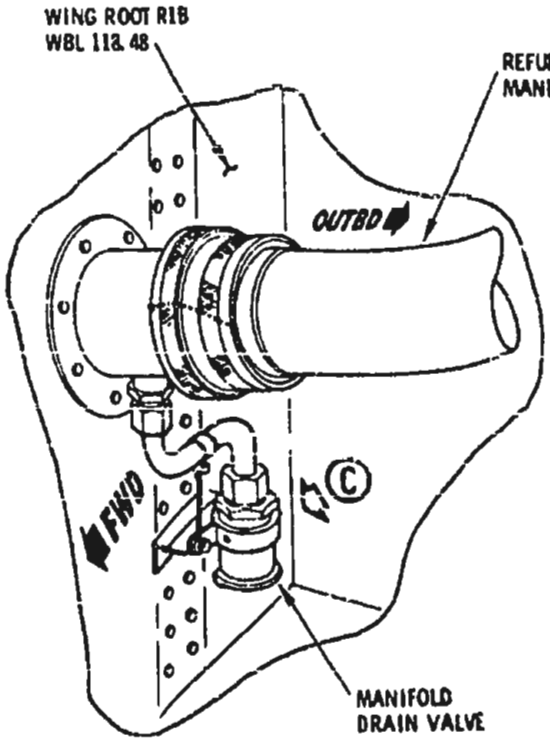
Leakage of fuel past engine No. 1 and 3 fuel feed manifold connectors and firewall shutoff valve plug-in element seals is ported overboard through drain lines (Ref. Fig. 5).

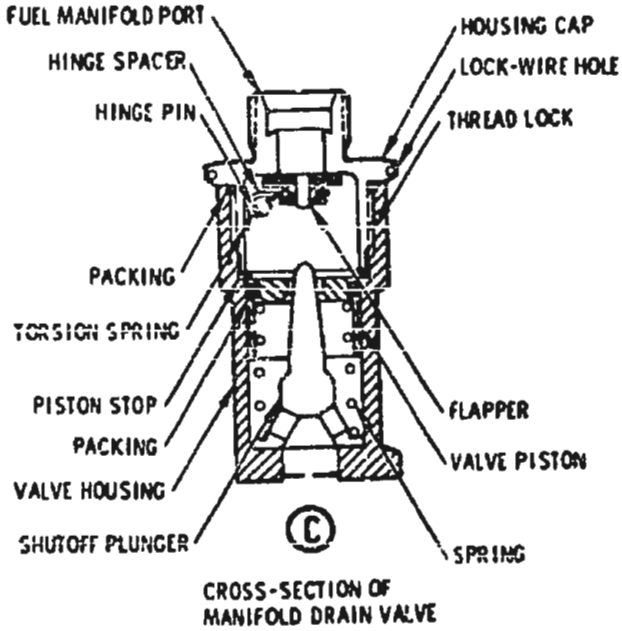


NOTE

(A) TANK 1

(B) TANK 3, OPPOSITE OF VIEW SHOWN





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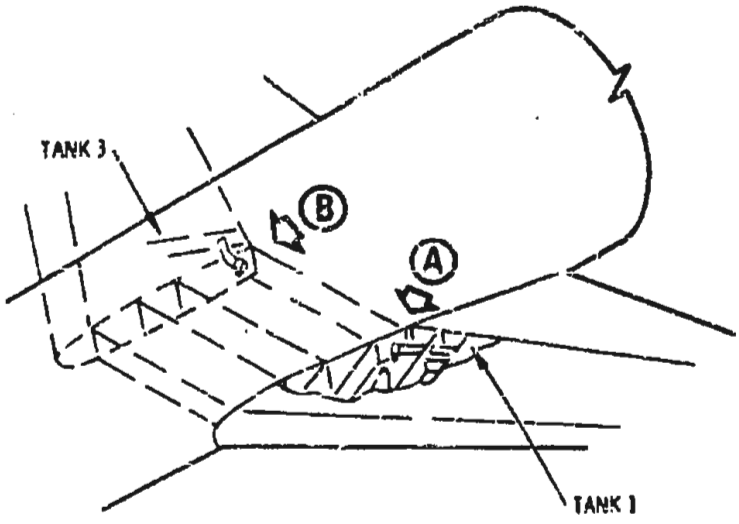
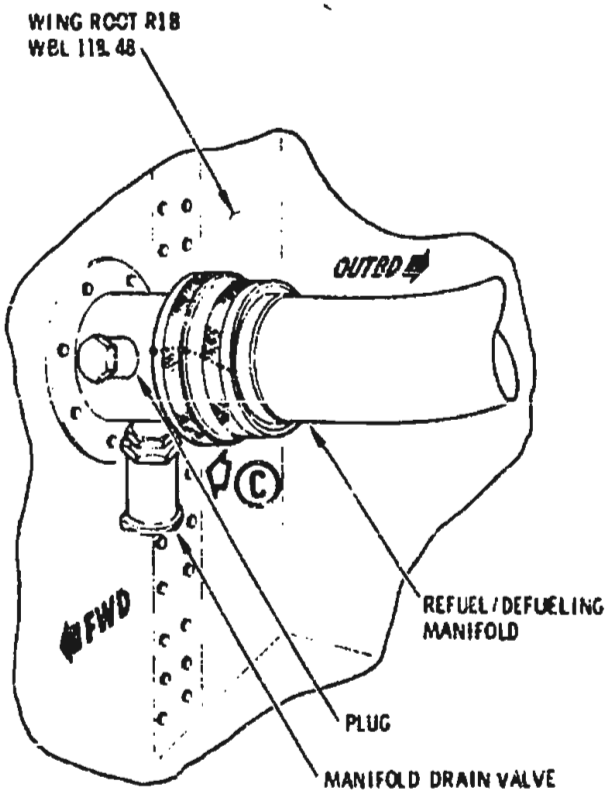
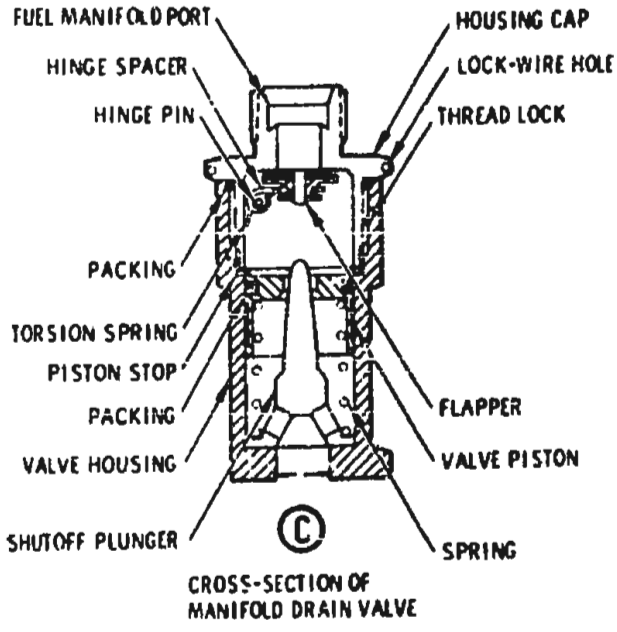
Fueling/Defueling Manifold Drain Valve
Figure 4

R EFFECTIVITY: 001-031 WITHOUT SB28-053
R
001R



NOTE
(A) TANK 1
(B) TANK 3, OPPOSITE OF VIEW SHOWN





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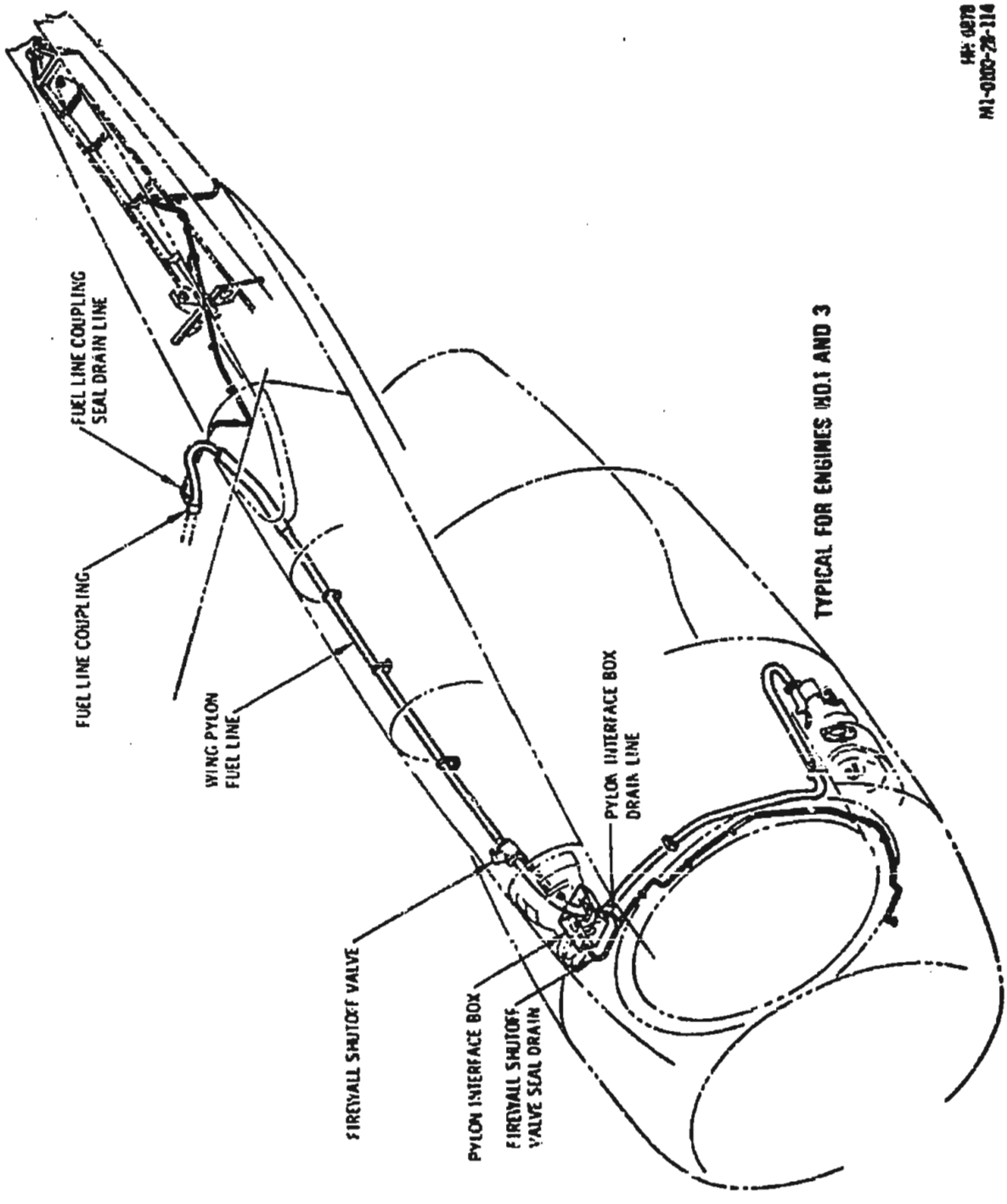
Fueling/Defueling Manifold Drain Valve
Figure 4


FUEL LINE COUPLING SEAL DRAIN LINE
FUEL LINE COUPLING
WING PYLON FUEL LINE
FIREWALL SHUTOFF VALVE
PYLON INTERFACE BOX
FIREWALL SHUTOFF VALVE SEAL DRAIN
PYLON INTERFACE BOX DRAIN LINE
TYPICAL FOR ENGINES NO.1 AND 3

Engine 1 and 3 Fuel Line Connector Drains
Figure 5

WING TANK FUEL AND CONDENSATE DRAIN VALVE REMOVAL AND INSTALLATION

1. General

Fuel and condensate drain valves permit underwing draining of fuel and condensate from the fuel tanks. Ten drain valves are installed; one in each fuel boost pump box, and one in the lowest area of each fuel tank, including the outboard sections of tanks No. 2L and 2R. The incorporation of primary and secondary poppet assemblies is a design feature that permits removal of the primary poppet assembly, for replacement of or installation of new O-ring packing, without removal of the complete drain valve assembly or loss of fuel. Separate procedures are included for removal and installation of either drain valve assembly or primary poppet assembly and for replacing primary poppet assembly O-ring packings. Fuel tank draining is necessary only if the drain valve assembly is to be replaced.

2. Equipment and Materials

Lock-wire - Fed Spec QQ-W-390, 0.032-inch diameter.

Packing (Ref. Fig. 401)

Grease, Fluorosilocone, Dow Corning FS-1291 or equivalent

3. Referenced Procedures

12-11-05	Condensate Drain Valves - Servicing
28-11-00	Tanks - Maintenance Practices
28-22-00	Defueling System - Maintenance Practices
57-33-01	Access Cover Plates and Doors - Removal and Installation

4. Removal/Installation

A. Removal

WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY PRECAUTIONS (REF. 28-11-00).

(1) Defuel the applicable fuel tank (Ref. 28-22-00).

(2) Remove tank access cover that provides most convenient access to the drain valve being replaced (Ref. 57-33-01).

WARNING: BEFORE ENTERING FUEL TANKS, VERIFY THAT ADEQUATE FLOW OF VENTILATING AIR IS BEING SUPPLIED TO THE TANK (REF. 28-11-00).

(3) While second man, stationed below the wing, restrains valve body from rotating, remove valve retainer, washer, and insulator (Ref. Fig. 401).

(4) Remove drain valve from wing lower surface.

B. Installation

(1) Clean faying surface and edge of hole in wing lower surface. Install new lightly greased O-ring packing on valve body flange, and insert valve through hole (Ref. Fig. 401).

(2) Place insulator and then washer on valve body.

(3) While second man, stationed below the wing, restrains valve body from turning install valve retainer and torque 80 to 90 lb in.

(4) Safety valve retainer to valve body with lock-wire. Bend lock-wire pigtail against valve body.

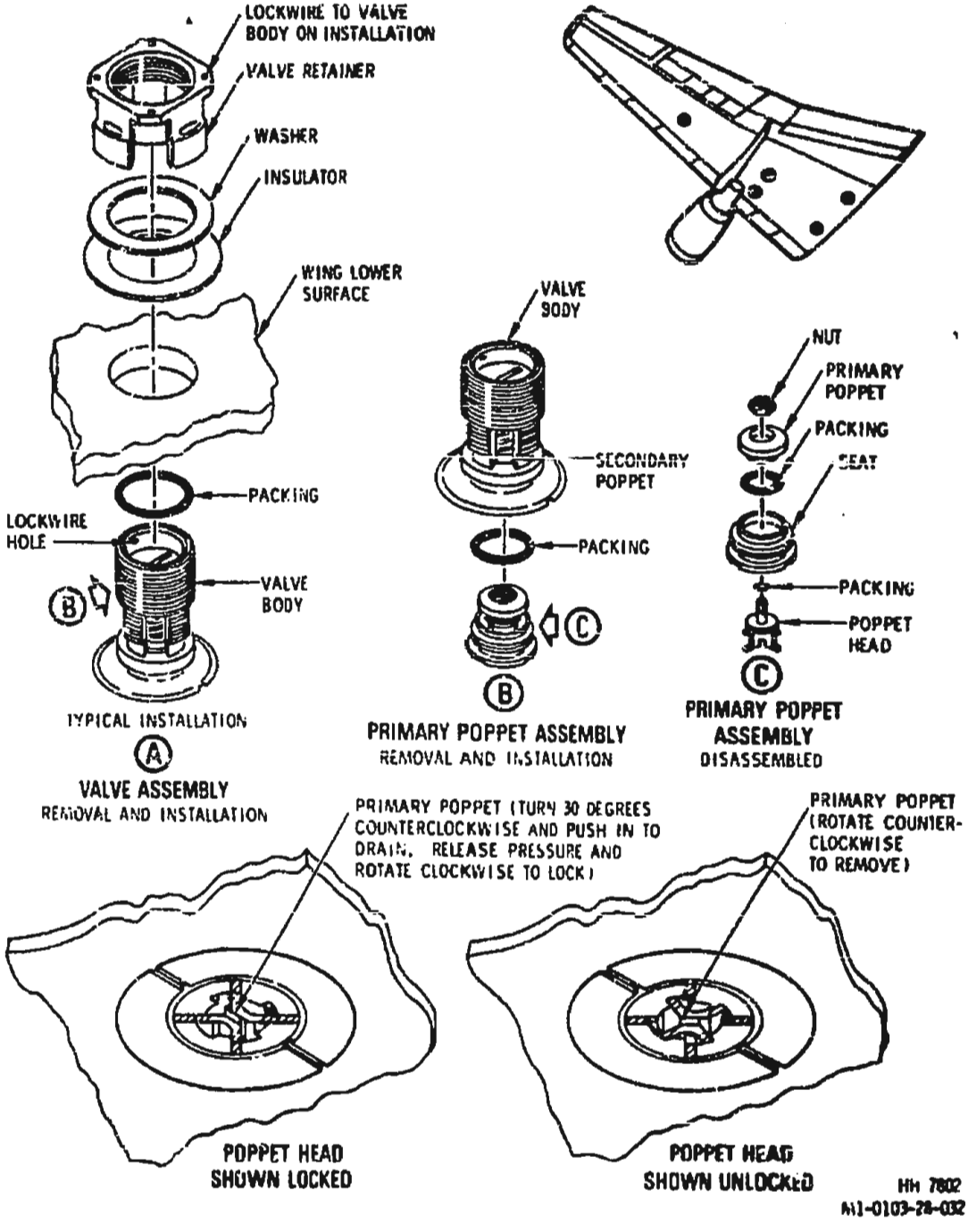
(5) Reinstall access cover (Ref. 57-33-01).

(6) After fueling tank, check valve installation for leaks.

5. Primary Poppet Assembly Maintenance

A. Removal

(1) Using slot screwdriver, rotate the primary poppet head counterclockwise until tangs contact seat. Continue counterclockwise rotation to unscrew poppet assembly seat out of drain valve body (Ref. Fig. 401).



R Fuel and Condensate Drain Valve - Removal and Installation
R Figure 401

EFFECTIVITY: ALL

001B

B. Replacement of O-ring Packing

(1) Remove self-locking nut and lift poppet off poppet head stem (Ref. Fig. 401).

(2) Disengage poppet head from seat.

(3) Replace lightly greased O-ring packing on poppet head stem.

(4) Replace lightly greased O-ring packing on poppet.

(5) Insert poppet head into seat, install poppet, and replace self-locking nut.

C. Installation

(1) Install new lightly greased O-ring packing on poppet assembly seat.

(2) Screw poppet assembly into drain valve body and tighten to a torque value of 60 to 80 lb in.

WARNING: HAVE A CONTAINER HANDY TO CATCH DRAINED FUEL. DO NOT STAND DIRECTLY UNDER DRAIN VALVE.

(3) Check operation of primary poppet by rotating poppet head counterclockwise (to unlock position) and pushing inward (to drain position). Verify that the primary poppet assembly operates easily with no evidence of binding. Relax force on poppet and rotate it clockwise to the locked position. Verify that the operation is smooth with no hesitation or drag.

FUELING/DEFUELING MANIFOLD DRAIN VALVE - REMOVAL AND INSTALLATION

1. General

One fueling/defueling manifold drain valve is installed in the
R aft inboard corner of tank No. 1 and 3.

2. Equipment and Materials

Lock-wire, Fed. Spec. QQ-W-390, 0.032-inch diameter, or equivalent

Pre-formed packing

3. Referenced Procedures

6-40-00	Access Doors - Removal and Installation
12-11-11	Servicing - Underwing Pressure Fueling
24-00-00	Electrical Power System - Maintenance Practices
28-11-00	Tanks - Maintenance Practices
28-22-00	Defueling System - Maintenance Practices
57-33-01	Cover Plates and Doors Access - Removal and Installation

4. Removal/Installation

R A. Preliminary Procedures

WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/ SERVICING OPEATIONS IS STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. PERSONNEL ENTERING TANK MUST WEAR APPROVED CLOTHING AND AIRLINE RESPIRATORS. OBSERVE SAFETY PRECAUTIONS (REF. 28-11-00).

(1) Defuel applicable tank 1 or tank 3 (Ref. 28-22-00).

(2) On FE/SO FUEL SYSTEM panel, zone 215, verify that all fuel valve switchlights are in the valve closed position.

(3) On FE/SO aft circuit breaker panel CB3, zone 215, open and tag FUEL SYSTEM inboard and outboard boost pump circuit breakers (U3 through U15).

(4) Attach MAINTENANCE IN PROGRESS tag to FUEL SYSTEM panel.

(5) Turn off electrical power and disconnect battery (Ref. 24-00-00).

(6) Remove applicable wing access covers 531 AB, DB, EB, FB or 631 AB, DB, EB, FB (Ref. 6-40-00 and 57-33-01).

(7) Ventilate fuel tank until tank atmosphere is at prescribed level permissible for tank entry (Ref. 28-11-00).

(8) Enter fuel tank and locate fueling/defueling manifold drain valve in aft inboard corner of boost pump surge box.

B. Removal (Aircraft 001-031 Without SB28-053)

(1) Loosen drain line nut at top of valve (Ref. Fig. 401).

(2) Remove valve support clamp fasteners.

(3) Separate valve from clamp.

R B. Removal (Aircraft 001-031 With SB28-053, 032-099)

(1) Remove drain valve. Valve is threaded into a boss on the fueling/defueling manifold fitting (Ref. Fig. 401).

C. Installation (Aircraft 001-031 Without SB28-053)

(1) Insert valve in support clamp (Ref. Fig. 401).

(2) Insert valve in support clamp.

(3) Engage valve to drain line and tighten drain line nut.

(4) Clean sealant from lug of bonding jumper.

NOTE: When installing clamp, engage lug to clamp support screw before installing washer and nut.

(5) Attach support clamp to bracket.

(6) Apply film of sealant over support clamp fasteners (Ref. 28-11-00).

(7) Reinstall tank access cover removed in Step 4A(6).

(8) Reconnect aircraft battery (Ref. 24-00-00).

(9) Remove tags and close circuit breakers opened in Step 4A(3) and remove MAINTENANCE-IN-PROGRESS tag from FUEL SYSTEM panel.

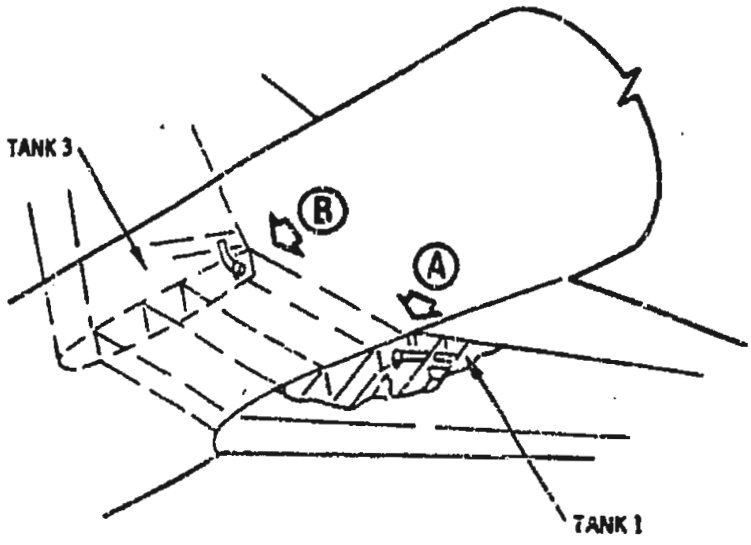
R C. Installation (Aircraft 001-031 With SB28-053, 032-099)

(1) Install new pre-formed packing on valve (Ref. Fig. 401).

(2) Install valve in threaded boss at bottom of fueling/defueling manifold fitting.

(3) Reconnect aircraft battery (Ref. 24-00-00)

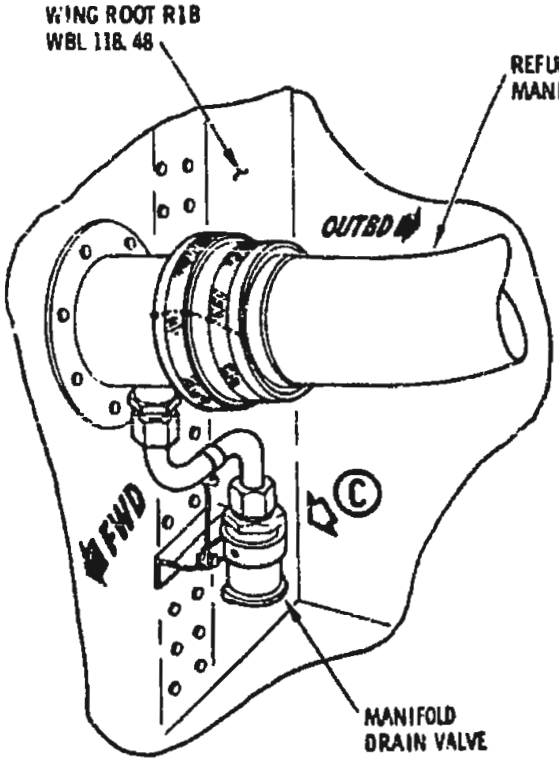
(4) Remove tags and close circuit breakers opened in Step 4A(3) and remove MAINTENANCE-IN-PROGRESS tag from FUEL SYSTEM panel.

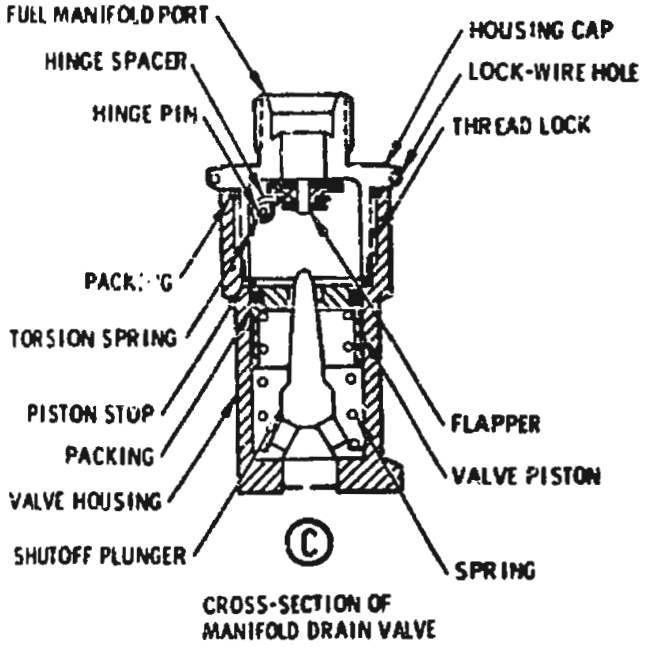


NOTE

(A) TANK 1

(B) TANK 3, OPPOSITE OF VIEW SHOWN





CROSS-SECTION OF MANIFOLD DRAIN VALVE

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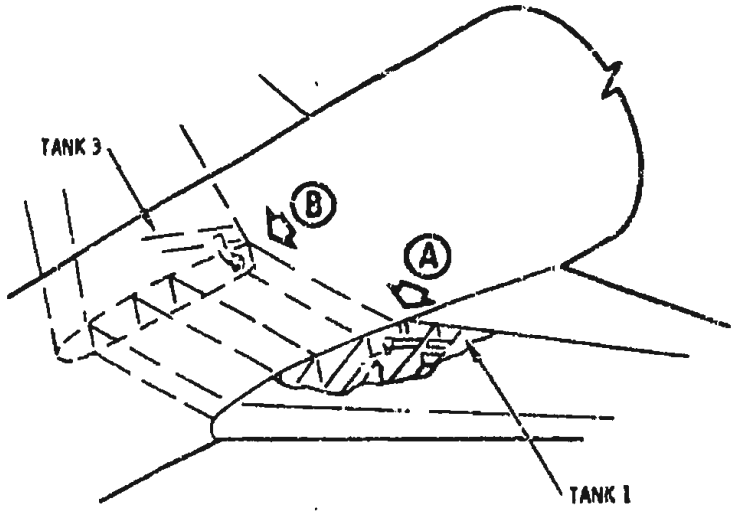
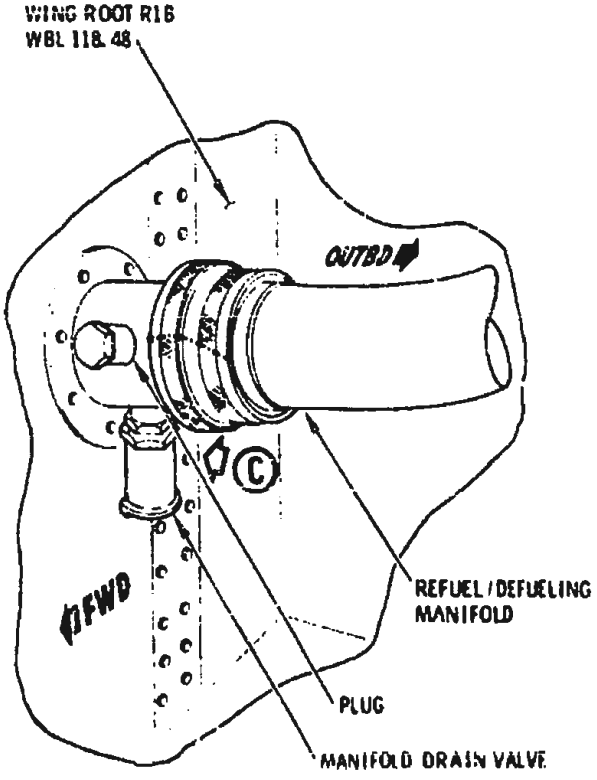
R Fueling/Defueling Manifold Drain Valve - Removal and Installation
R Figure 401

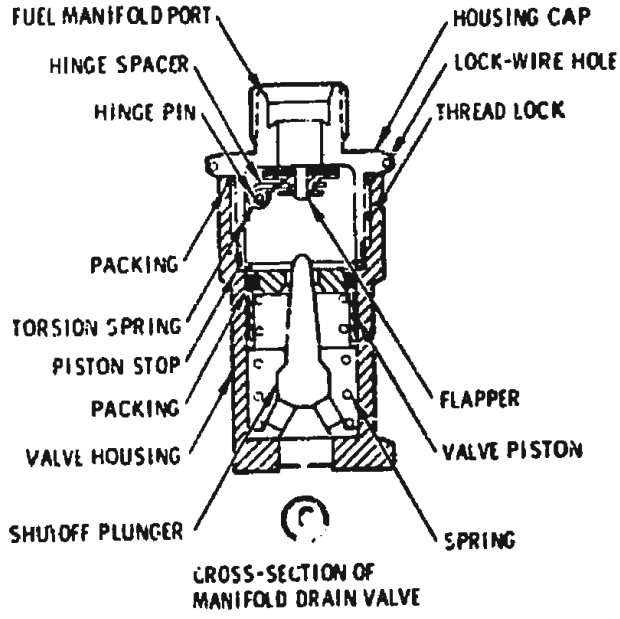
R EFFECTIVITY: 001-031 WITHOUT SB28-053

U011B



NOTE
(A) TANK 1
(B) TANK 3, OPPOSITE OF VIEW SHOWN





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Fueling/Defueling Manifold Drain Valve - Removal and Installation
Figure 401

R EFFECTIVITY: 001-031 WITH SB28-053, 032-099
R
0018

TANK 1A/3A FUEL AND CONDENSATE DRAIN VALVE REMOVAL AND INSTALLATION

1. General

Fuel and condensate drain valves permit draining of fuel and condensate from the wing center section fuel tanks. Two drain valves are installed; one in each tank. The valves incorporate a primary seal which may be changed without the loss of fuel or removal of the valve assembly. Separate procedures are included for removal and installation of primary drain valve seals and drain valve assemblies. Fuel tank draining is necessary only if the drain valve assembly is to be replaced.

2. Equipment and Materials

Lock-wire - Fed Spec QQ-W-390, 0.032-inch diameter

Packing (Ref. Fig. 401)

Grease, Fluorosilicone, Dow Corning FS-1291 or equivalent

3. Referenced Procedures

6-50-00	Interior Access Panels
12-11-05	Condensate Drain Valve - Servicing
28-11-00	Tanks - Maintenance Practices
28-22-00	Defueling System - Maintenance Practices

4. Removal/Installation

WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY PRECAUTIONS (REF. 28-11-00).

A. Removal (Primary Drain Valve Seal)

(1) Enter center section keelson area through access door 1420B.

(2) Under wing center section box, locate drain valve tube, zone 143 or 144.

(3) Remove lockwire and back off tube connector at drain valve seat (Ref. Fig. 401).

(4) Pull drain tube downward out of valve and disengage valve actuating probe from valve assembly piston. Have assistant below the aircraft pull tube and probe out of fuselage fairing.

(5) Cut lockwire and remove valve seat attach bolts. Remove valve seat. As valve seat is removed, internal valve assembly spring will push valve piston downward and expose the primary O-ring seal.

WARNING: DO NOT PUSH UP ON VALVE PISTON OR FUEL MAY BE SPILLED.

NOTE: Fuel seepage from area around valve piston is an indication that secondary seal is faulty. To replace secondary seal, valve assembly will have to be removed and replaced or disassembled to replace seal.

(6) Remove faulty primary seal.

B. Installation (Primary Drain Valve Seal)

(1) Lubricate new packing with film of fluorosilicone grease and install on valve piston (Ref. Fig. 401).

NOTE: For indexing purposes, one of the four valve seat bolt holes is off-center.

(2) Using valve seat, push up on piston. Align valve seat holes and install valve seat attach bolts (Ref. Fig. 401).

(3) Safety bolts with lock-wire.

(4) Install new lubricated O-ring packings at upper and lower ends of drain tube.

(5) Insert probe into drain tube. Push tube upward through hole in fuselage fairing to man in keelson area.

(6) Engage actuating probe tang to slot in valve piston, then engage drain tube to indexing pin and attach connector. Tighten connector until fully seated.

(7) Safety connector to valve seat with lock-wire.

WARNING: HAVE A CONTAINER HANDY TO CATCH DRAINED FUEL. DO NOT STAND DIRECTLY UNDER DRAIN VALVE.

(8) Rotate probe to unlocked position and push upward to check valve operation. Verify that valve operates easily with no evidence of binding. Relax force on probe and rotate to locked position. Verify that operation is smooth with no hesitation or drag.

(9) Check drain tube for leakage.

(10) Remove tools and equipment from Keelson area and close keelson area access door 142DB.

C. Removal (Drain Valve)

(1) Defuel applicable 1A/3A fuel tank (Ref. 28-22-00).

(2) Attach MAINTENANCE-IN-PROGRESS tags to flight station fuel system panel, zone 215, and fueling/defueling panel, zone 621.

(3) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag all row U fuel boost pump and defuel valve circuit breakers.

(4) Remove drain tube, valve actuating probe, and valve assembly seat (Ref. Step A).

(5) Enter center section box through access hole 141AZ (Ref. 6-50-00).

(6) Remove applicable tank access panel (Ref. 6-50-00).

WARNING: BEFORE ENTERING FUEL TANK, VERIFY THAT ADEQUATE FLOW OF VENTILATING AIR IS BEING SUPPLIED TO THE TANK (REF. 28-11-00).

(7) Remove lock-wire from valve body and castellated nut (Ref. Fig. 401).

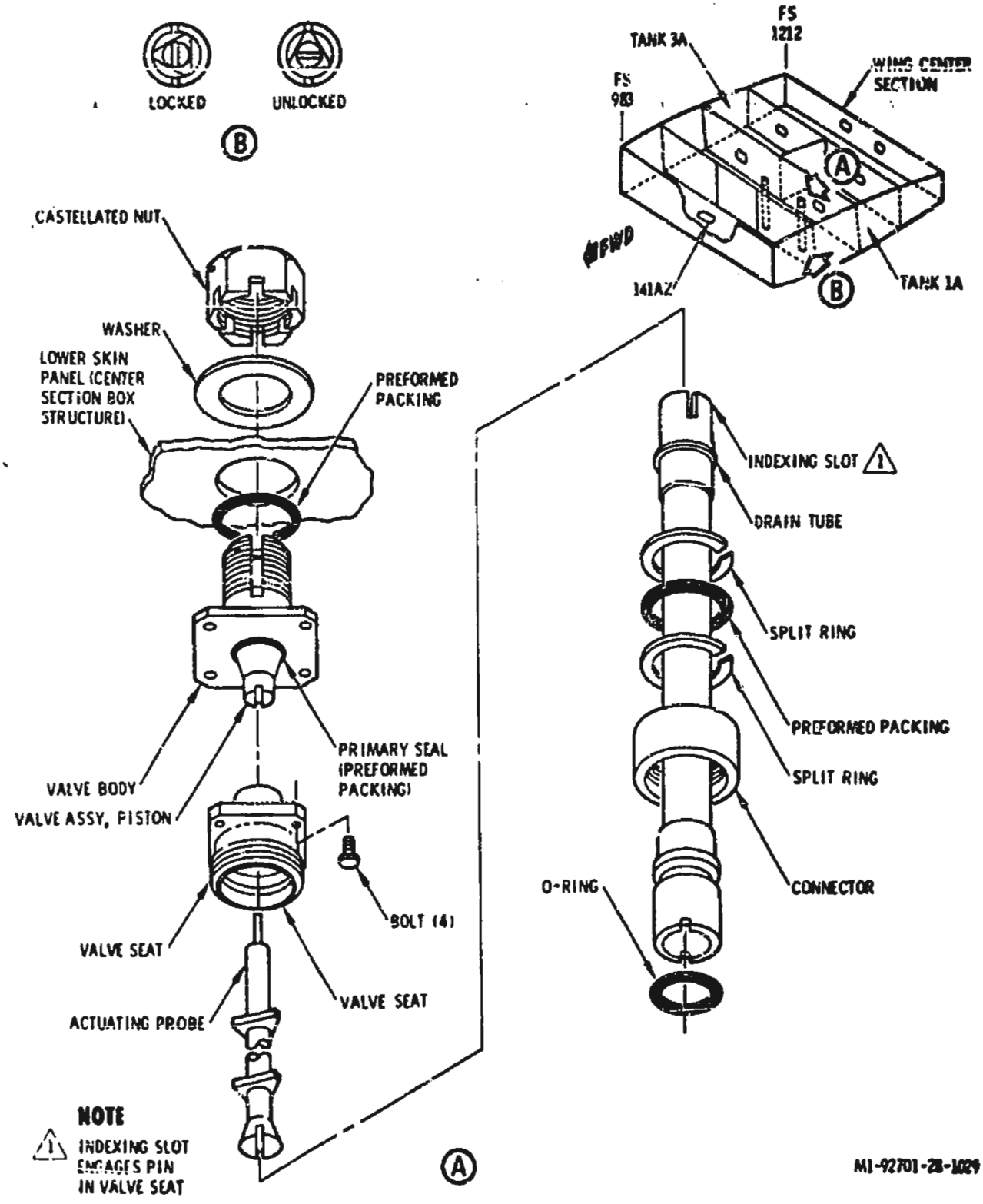
(8) While second man in keelson area restrains valve body from rotating, remove castellated nut and washer.

(9) Remove drain valve.

D. Installation (Drain Valve)

(1) Install new lubricated O-ring packing on valve body, and insert valve in its installed position (Ref. Fig. 401).

(2) Place washer on valve body.



Drain Valve - Removal and Installation
Figure 401

(3) While man in keelson area restrains valve body from turning, install castellated nut. Tighten nut 90 to 120 lb in.

(4) Safety nut to valve body with lock-wire. Bend lock-wire pigtail against valve body.

(5) Reinstall valve seat, actuating probe, and drain tube, Ref. Step 4B(2) through (7).

(6) Remove tools and equipment and reinstall tank access panel.

(7) Remove tags and close circuit breakers opened in Step 4C(1).

(8) Transfer approximately 400 lbs (180 Kg) of fuel into tank.

(9) Check drain valve operation (Ref. Step 4B(7).

(10) Reinstall center section access panel 141AZ.

(11) Close keelson area access door 142DB.

(12) Remove MAINTENANCE-IN-PROGRESS tags.

ENGINE FUEL FEED SYSTEM - DESCRIPTION AND OPERATION

1. General

The engine feed system is a combination of manifolds, boost
R pumps and valves (Ref. Fig. 1 and 2) controlled from the FUEL
R SYSTEM panel at the Flight Engineer/Second Officers (FE/SO)
R station zone 215 (Ref. Fig. 3). The No. 1 and 3 tanks each contain a fuel boost pump assembly with two identical ac motor-driven centrifugal pump and motor assemblies and two check valves within a single scroll housing. The system includes a dc motor-actuated tank shutoff valve on the forward tank wall, a dc motor-actuated emergency (firewall) shutoff valve within the No. 1 and No. 3 engine pylons aft of the firewall, and interconnecting plumbing to the engine interface. The lines connect to the engine plumbing for final fuel feed to the engine-driven low-pressure pump inlet. The feed system for engine No. 2 consists of two pumps (identical to those in the No. 1 and 3 tanks) in each inboard section of tanks No. 2L and 2R. A manually operated shutoff valve for each line is provided for removal and installation of the flow equalizer without defueling the aircraft. The purpose of the flow equalizer is to balance the two tributary flows from tanks 2L and 2R. A dc motor-actuated isolation valve is located at the aft wall of the center section, and two dc motor-actuated emergency (firewall) shutoff valves are located in front of the firewall. Interconnecting plumbing extends to the power plant interface where the line connects to the engine plumbing for feed to the engine-driven low-pressure pump. All fuel lines in the wing are routed inside the tanks. The No. 2 engine feed line is enclosed in a tubular shroud and routed through the cabin floor support beams to the engine fuel line interface coupling at the aft pressure bulkhead. Any fuel leakage that might occur at the fuel line couplings in the cargo compartment areas is contained by the shroud and syphoned out of the aircraft through the hydraulic service compartment and afterbody area drain masts.

Fuel can be supplied from any combination of the three tank systems or any single tank system to any engine (Ref. 28-26-00). A crossfeed system connects the normal tank-to-engine feed lines through appropriate dc motor-actuated shutoff valves controlled at the FE/SO station.

The fuel boost pumps also provide the motive fuel pressure required for operation of the jet ejector pumps in the fuel scavenge system (Ref. 28-11-00) and wing center section fuel transfer system (Ref. 28-27-00). The boost pumps have screened inlet and outlet ports and removable check valves located in the discharge housing. Flow is available from either boost pump element.

The scavenge system works jointly with the surge box wall-mounted flapper check valves for supplying fuel to the boost pumps (as in a recirculating system). The scavenge system only operates when the boost pumps are operating. Check valves are mounted on the ejectors at their exit ports into the No. 2 tank surge boxes. These check valves prevent fuel from leaving the surge box when the airplane is parked and inboard compartment fuel level is low.

Engine 1 and 3 tank valves are electrically operated by 28V DC BUS 1 and DC BUS 3 power applied through the engine FIRE PULL handle switches and the tank valve switchlights on the FE/SO FUEL SYSTEM panel (Ref. Fig. 4). When the FIRE PULL handle is pulled, the power source is switched to the BAT BUS and 28V dc valve-closed power is applied directly to the tank valve actuator.

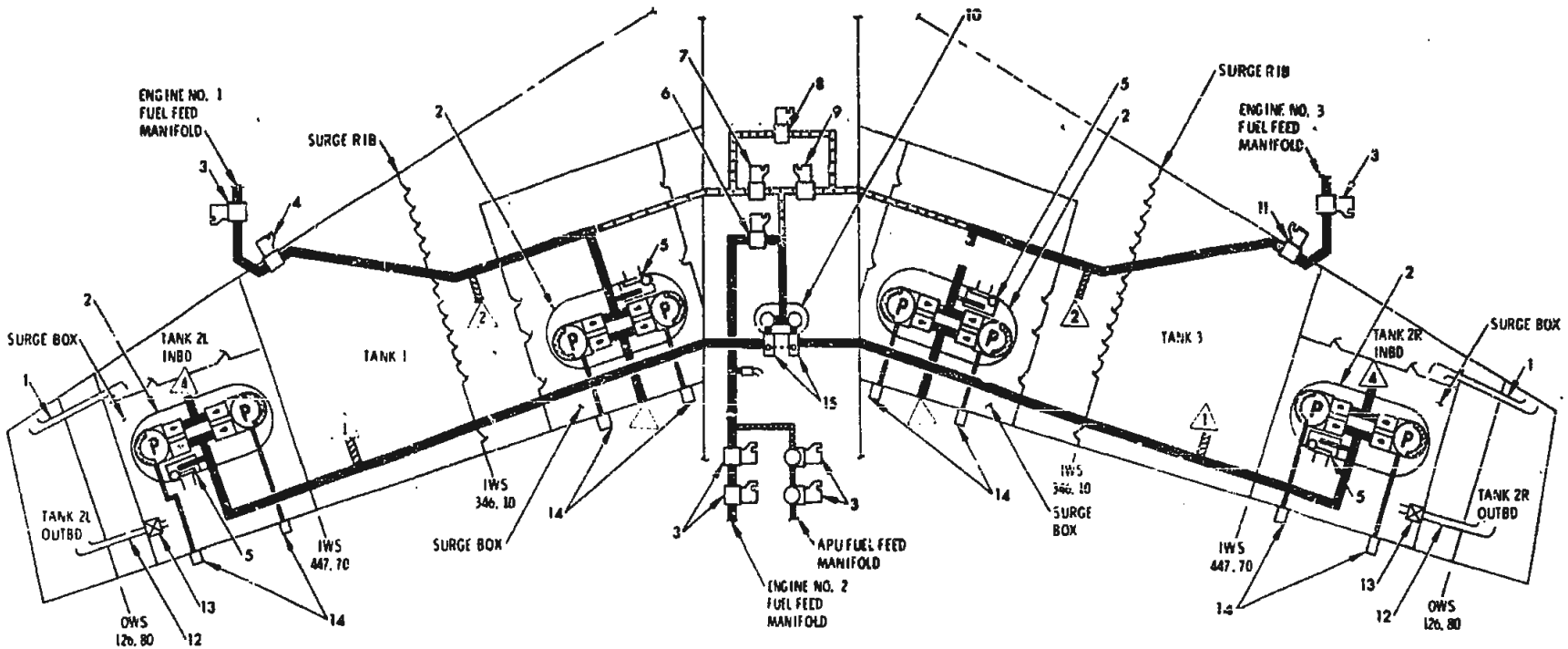
Closing of a tank valve isolates the respective engine fuel feed line from the fuel distribution system. Engine 1 and 3 firewall shutoff valves are operated by the fire pull handles and are powered by DC BUS 1 and DC BUS 3 respectively (Ref. Fig. 4). The firewall shutoff valves provide a means of quickly shutting off fuel flow to an engine during emergency shutdowns using the FIRE PULL handle.

The ENG 2 TANK VALVE power open and close circuits are wired directly through the ENG 2 TANK VALVE switch (Ref. Fig. 5). Pulling the engine No. 2 FIRE PULL handle has no effect on tank valve position. The engine No. 2 primary firewall shutoff valve is operated by 28V dc applied thru the engine fire pull handle switches. It is electrically opened by 28V DC BUS 3 power and closed by 28V BAT BUS power when the FIRE PULL handle is pulled (Ref. Fig. 5).

The engine No. 2 secondary firewall shutoff valve is operated by 28V dc from DC BUS 2 thru the engine fire pull handle switches (Ref. Fig. 5).

The flowbar symbol in each tank valve switchlight, when illuminated, indicates that the switchlight is in the valve open command position. The blue disagreement light normally comes on, and then goes out, to indicate that the tank valve is in-transit to the position commanded by the switchlight. If the light stays on, the valve is not in agreement with the switchlight position and a malfunction exists. Actuating the emergency pull handle removes the 28V dc power from the circuit and applies battery power to the valve closed circuit.

Each fuel tank boost pump assembly motor element is operated by a separate circuit (Ref. Fig. 6). Boost pump motor power is supplied from the 115/200V ac, 3-phase bus through the RCCB to the pump. When one of the TANK PUMPS switchlights is depressed,



CODE

- ENGINE FEED
- CROSSFEED
- APU FEED
- FLAPPER CHECK VALVE
- CHECK VALVE

NOTE

1. TO TANK 2L 2R DEFUEL VALVE
2. TO TANK 1 3 DEFUEL VALVE
3. TO TANK 1 3 FUEL SCAVENGE SYSTEM
4. TO TANK 2L 2R FUEL SCAVENGE SYSTEM

1 HIGH LEVEL FUEL XFR MANIFOLD
2 DUAL BOOST PUMP ASSEMBLY
3 FIREWALL SHUTOFF VALVES
4 ENG 1 TANK VALVE
5 BOOST PUMP BYPASS VALVE
6 ENG 2 TANK VALVE
7 1L XFEED/CROSSFEED VALVE
8 1C XFEED/CROSSFEED VALVE
9 1R XFEED/CROSSFEED VALVE
10 FUEL FLOW EQUALIZER
11 ENG 3 TANK VALVE
12 LOW FUEL TRANSFER MANIFOLD
13 FUEL TRANSFER (FLOAT) VALVE
14 BOOST PUMP LOW PRESSURE SWITCH
15 MANUAL SHUTOFF VALVES

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R
R Fuel Feed System Diagram
Figure 1

EFFECTIVITY: 001-024, 027

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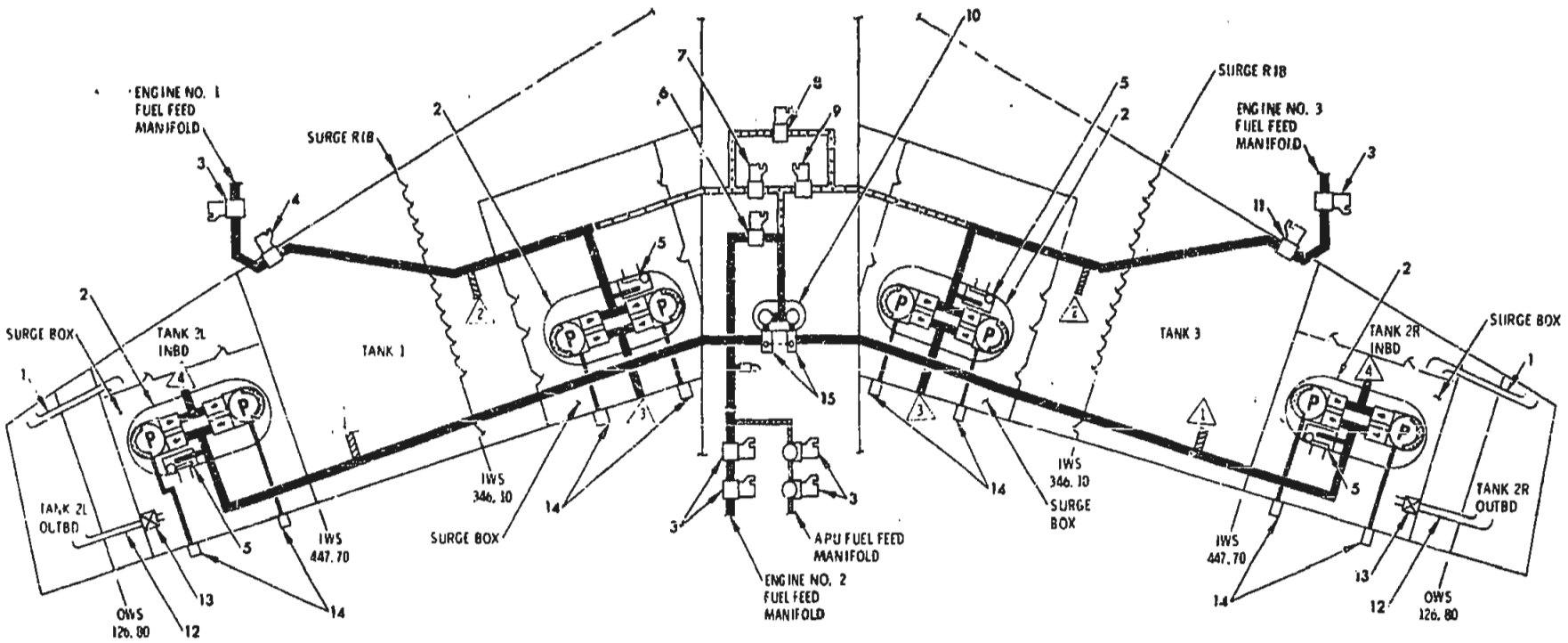

CODE

- ENGINE FEED
- CROSSFEED
- APU FEED
- FLAPPER CHECK VALVE
- CHECK VALVE

NOTE

1. TO TANK 2L 2R DEFUEL VALVE
2. TO TANK 1 3 DEFUEL VALVE
3. TO TANK 1 3 FUEL SCAVENGE AND TANK 1A 3A FUEL SCAVENGE AND FUEL TRANSFER SYSTEMS
4. TO TANK 2L 2R FUEL SCAVENGE SYSTEM

1 HIGH LEVEL FUEL XFR MANIFOLD
2 DUAL BOOST PUMP ASSEMBLY
3 FIREWALL SHUTOFF VALVES
4 ENG 1 TANK VALVE
5 BOOST PUMP BYPASS VALVE
6 ENG 2 TANK VALVE
7 (L XFEED) CROSSFEED VALVE
8 (C XFEED) CROSSFEED VALVE
9 (R XFEED) CROSSFEED VALVE
10 FUEL FLOW EQUALIZER
11 ENG 3 TANK VALVE
12 LOW FUEL TRANSFER MANIFOLD
13 FUEL TRANSFER (FLOAT) VALVE
14 BOOST PUMP LOW PRESSURE SWITCH
15 MANUAL SHUTOFF VALVES

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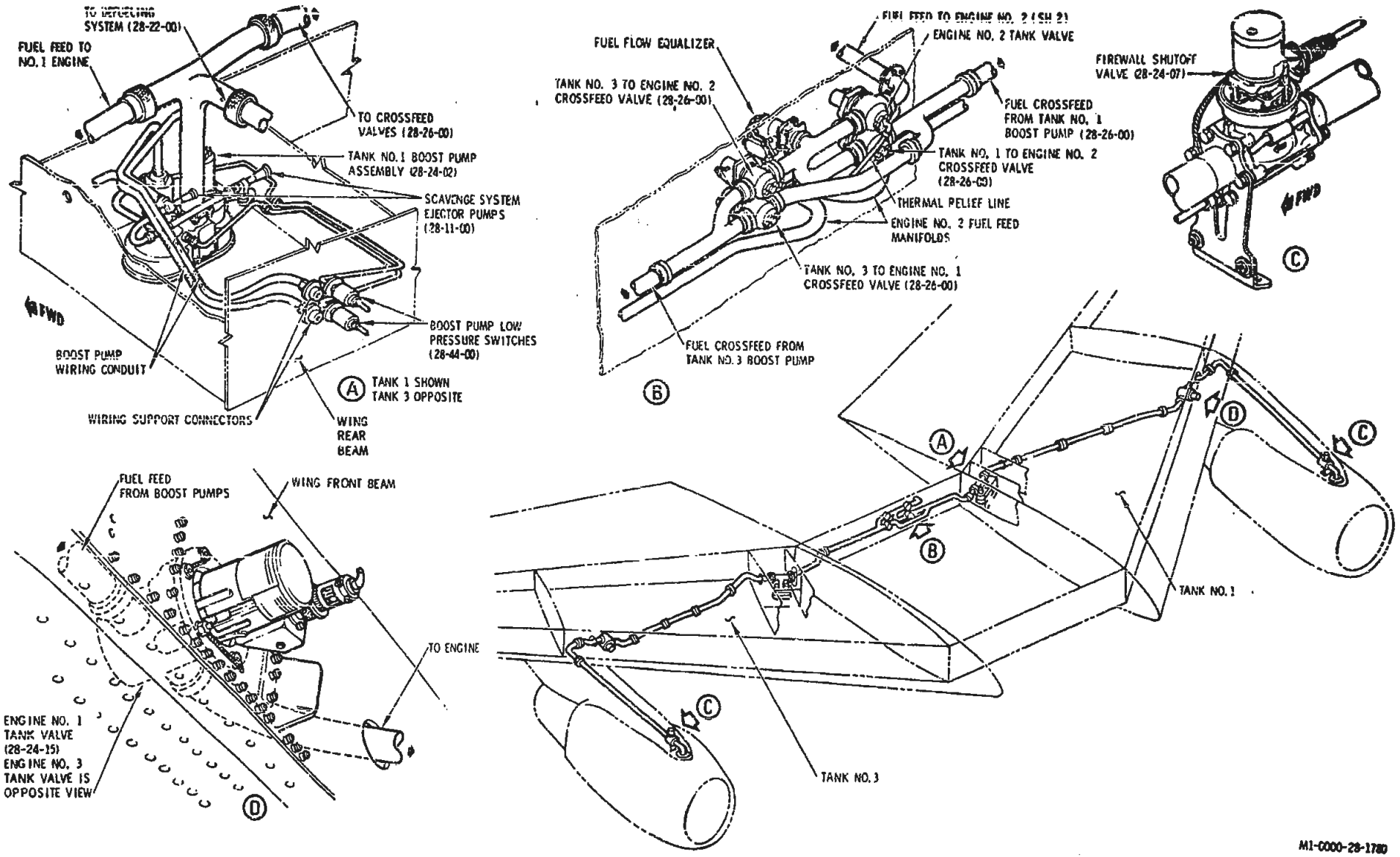
Fuel Feed System Diagram
Figure 1

R
R
001B EFFECTIVITY: 025-026, 028-999


TO REFUELING SYSTEM (28-22-00)
FUEL FEED TO NO. 1 ENGINE
TO CROSSFEED VALVES (28-26-00)
TANK NO. 1 BOOST PUMP ASSEMBLY (28-24-02)
SCAVENGE SYSTEM EJECTOR PUMPS (28-11-00)
FWD
BOOST PUMP LOW PRESSURE SWITCHES (28-44-00)
BOOST PUMP WIRING CONDUIT
A TANK 1 SHOWN TANK 3 OPPOSITE
WIRING SUPPORT CONNECTORS
WING REAR BEAM
FUEL FEED TO ENGINE NO. 2 (SH 2)
ENGINE NO. 2 TANK VALVE
FUEL FLOW EQUALIZER
TANK NO. 3 TO ENGINE NO. 2 CROSSFEED VALVE (28-26-00)
FUEL CROSSFEED FROM TANK NO. 1 BOOST PUMP (28-26-00)
TANK NO. 1 TO ENGINE NO. 2 CROSSFEED VALVE (28-26-00)
THERMAL RELIEF LINE
ENGINE NO. 2 FUEL FEED MANIFOLDS
TANK NO. 3 TO ENGINE NO. 1 CROSSFEED VALVE (28-26-00)
FUEL CROSSFEED FROM TANK NO. 3 BOOST PUMP
B
FIREWALL SHUTOFF VALVE (28-24-07)
FWD
C
FUEL FEED FROM BOOST PUMPS
WING FRONT BEAM
TO ENGINE
ENGINE NO. 1 TANK VALVE (28-24-15)
ENGINE NO. 3 TANK VALVE IS OPPOSITE VIEW
D
A
B
C
D
TANK NO. 1
TANK NO. 3
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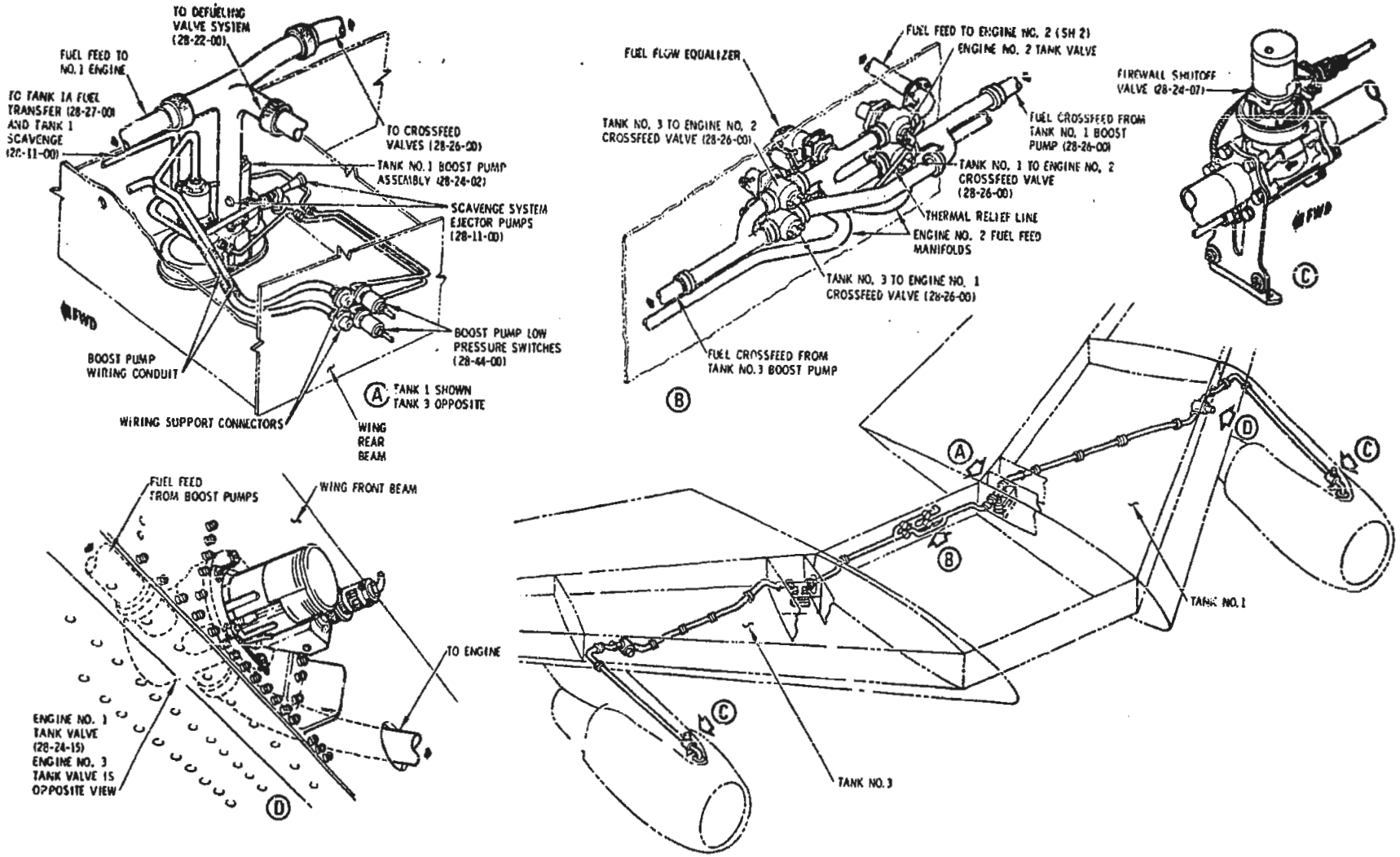
R Engine Fuel Feed System
R Figure 2 (Sheet 1)

EFFECTIVITY: 001-024, 027

001B


TO DEFUELING VALVE SYSTEM (28-22-00)
FUEL FEED TO NO. 1 ENGINE
TO TANK 1A FUEL TRANSFER (28-27-00) AND TANK 1 SCAVENGE (28-11-00)
TO CROSSFEED VALVES (28-26-00)
TANK NO. 1 BOOST PUMP ASSEMBLY (28-24-02)
SCAVENGE SYSTEM EJECTOR PUMPS (28-11-00)
FWD
BOOST PUMP LOW PRESSURE SWITCHES (28-44-00)
BOOST PUMP WIRING CONDUIT
A TANK 1 SHOWN TANK 3 OPPOSITE
WIRING SUPPORT CONNECTORS
WING REAR BEAM
FUEL FEED TO ENGINE NO. 2 (SH 2)
ENGINE NO. 2 TANK VALVE
FUEL FLOW EQUALIZER
TANK NO. 3 TO ENGINE NO. 2 CROSSFEED VALVE (28-26-00)
FUEL CROSSFEED FROM TANK NO. 1 BOOST PUMP (28-26-00)
TANK NO. 1 TO ENGINE NO. 2 CROSSFEED VALVE (28-26-00)
THERMAL RELIEF LINE
ENGINE NO. 2 FUEL FEED MANIFOLDS
TANK NO. 3 TO ENGINE NO. 1 CROSSFEED VALVE (28-26-00)
FUEL CROSSFEED FROM TANK NO. 3 BOOST PUMP
B
FIREWALL SHUTOFF VALVE (28-24-07)
FWD
C
FUEL FEED FROM BOOST PUMPS
WING FRONT BEAM
TO ENGINE
ENGINE NO. 1 TANK VALVE (28-24-15) ENGINE NO. 3 TANK VALVE IS OPPOSITE VIEW
D
A
B
C
D
TANK NO. 1
TANK NO. 3

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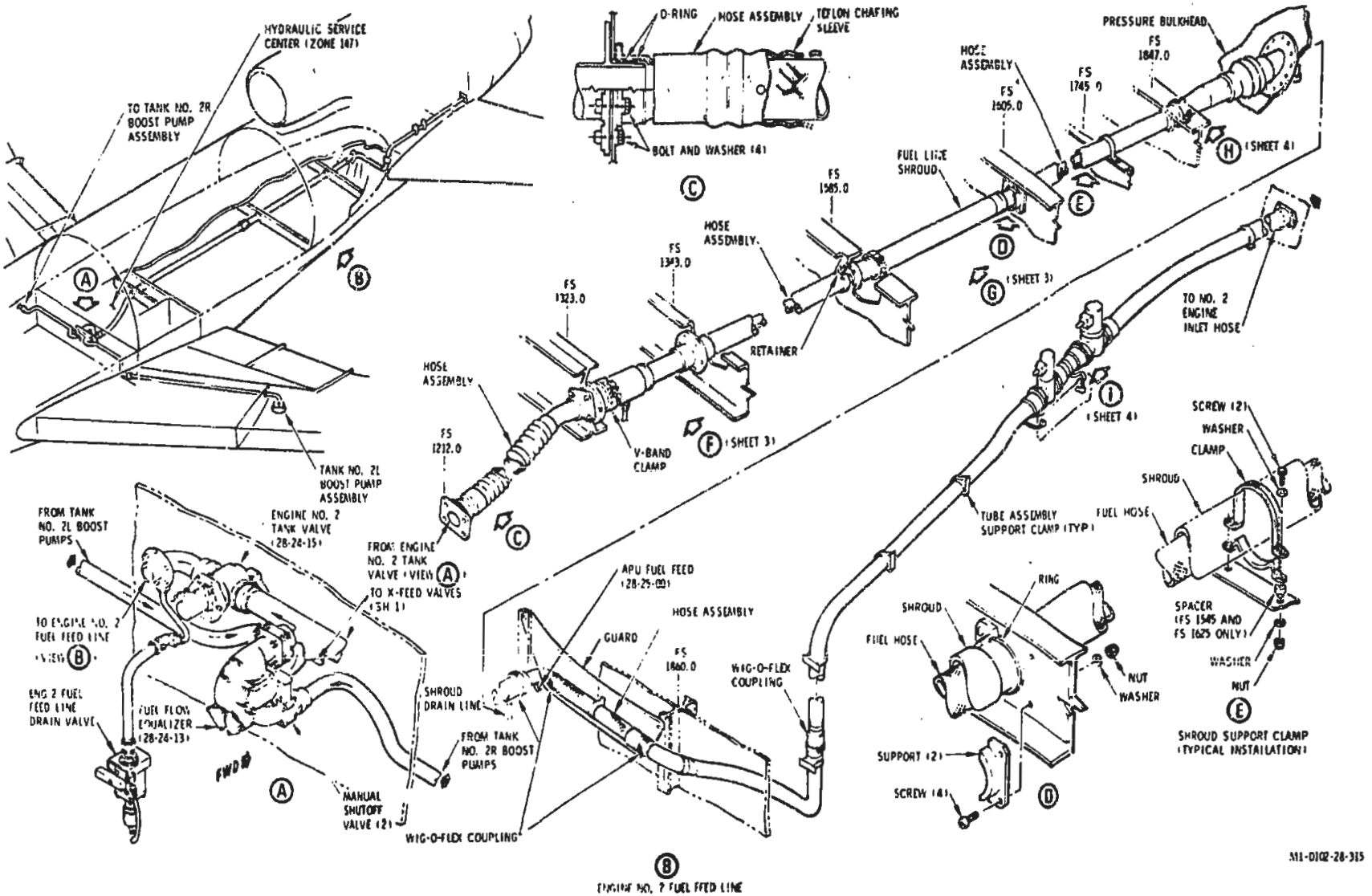
R Engine Fuel Feed System
R Figure 2 (Sheet 1)

EFFECTIVITY: 025-026, 028-999

001B

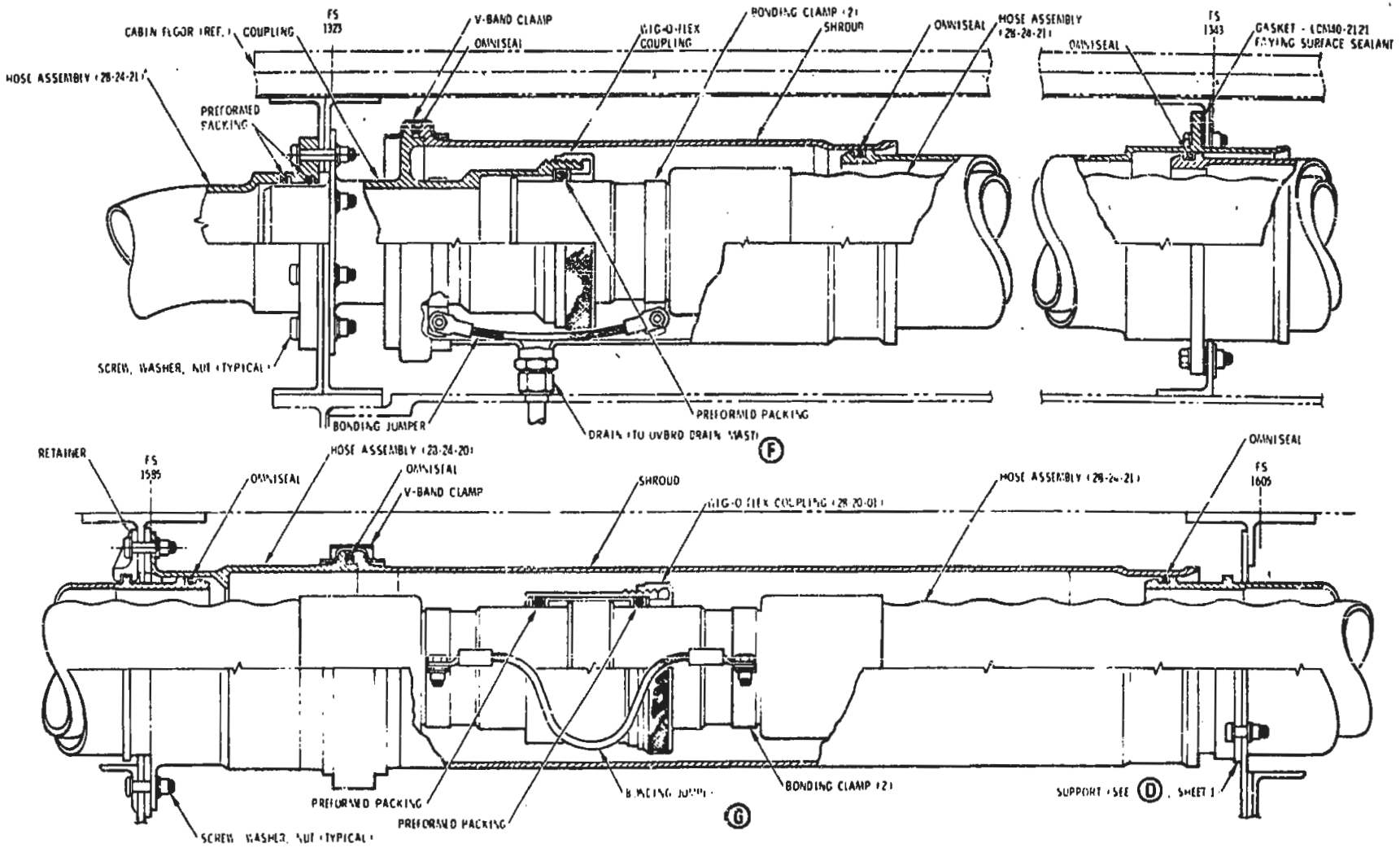


Engine Fuel Feed System
Figure 2 (Sheet 2)

R

EFFECTIVITY: ALL

0018



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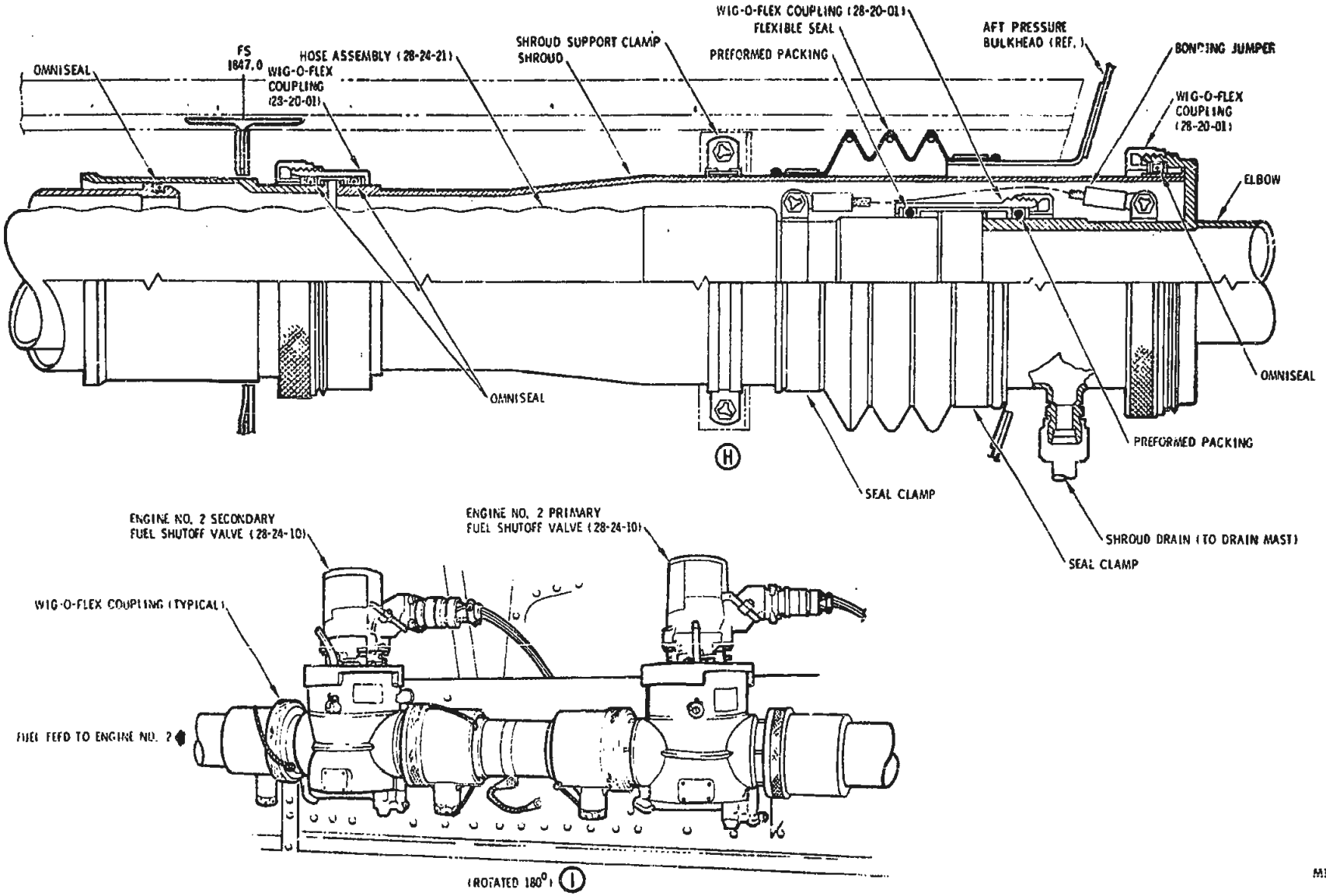
Engine Fuel Feed System
Figure 2 (Sheet 3)

R

R EFFECTIVITY: ALL
R
001B



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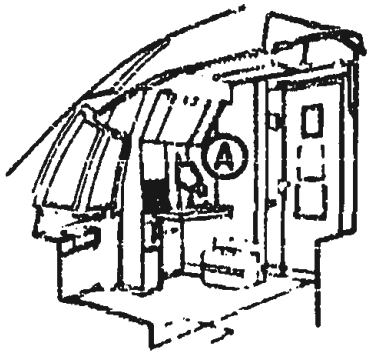
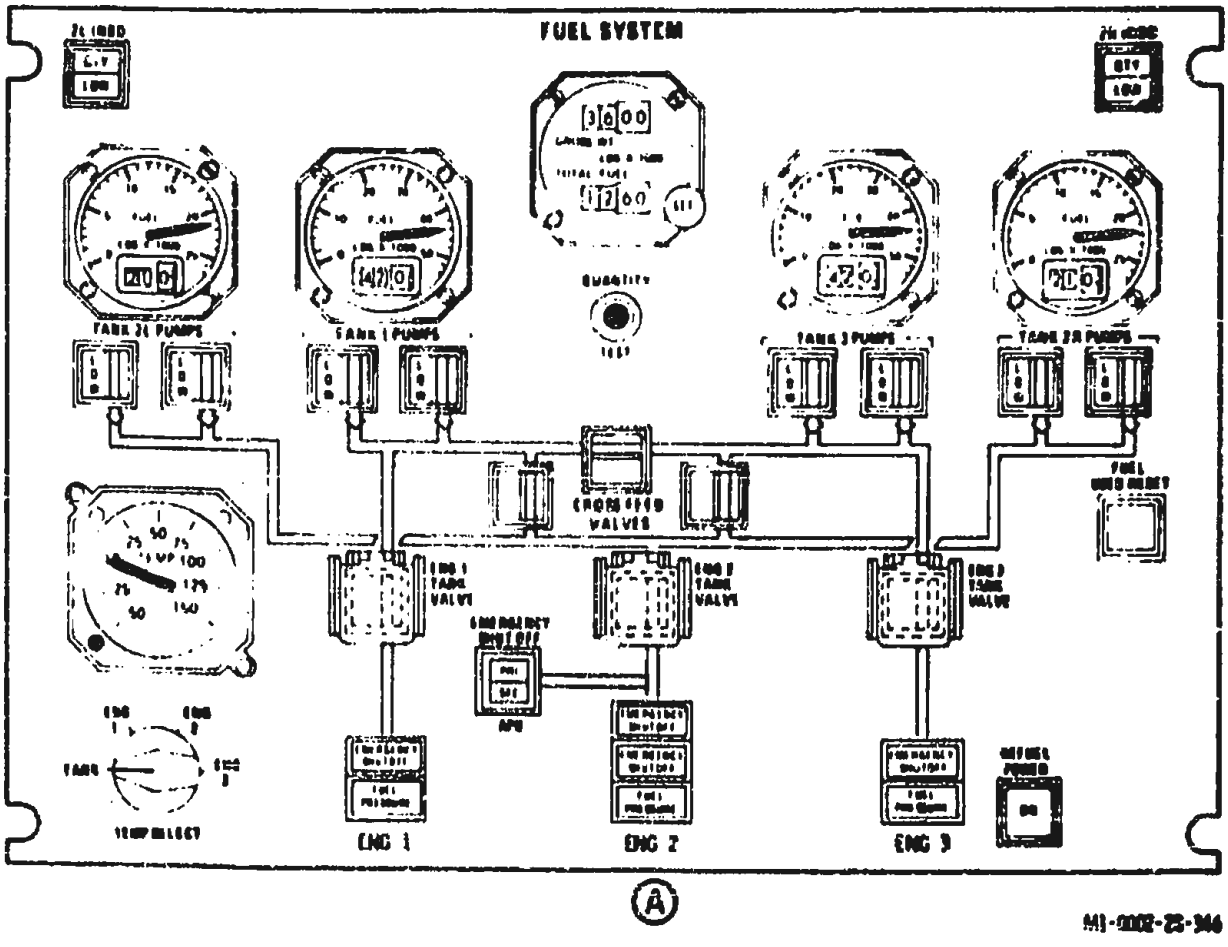
R Engine Fuel Feed System
R Figure 2 (Sheet 4)

EFFECTIVITY: ALL

0018

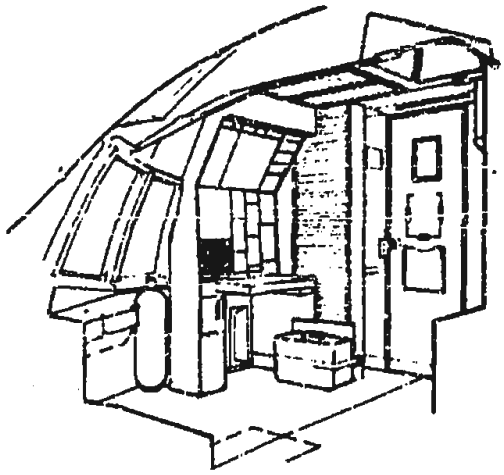


FLIGHT ENGINEER/SECOUND OFFICERS STATION
ZONE 215

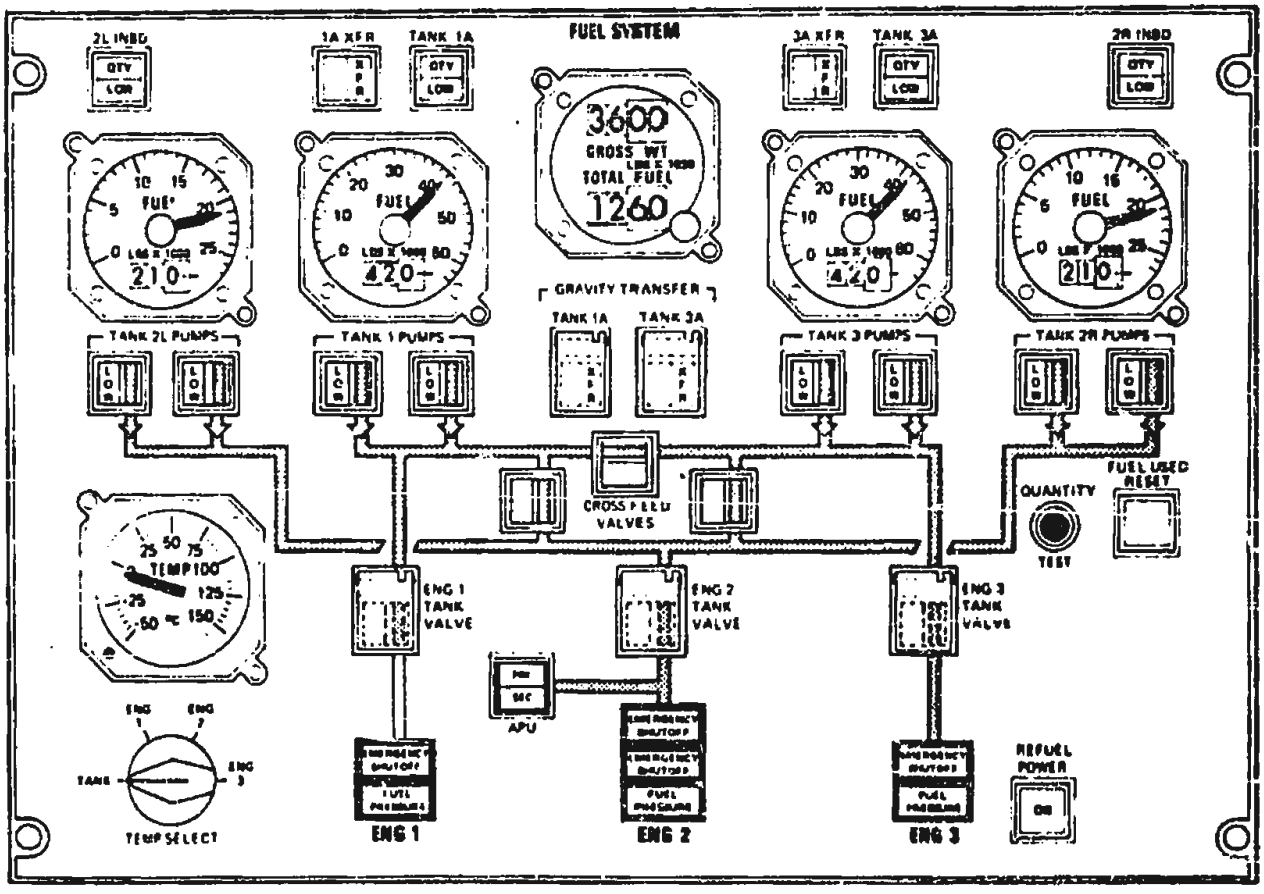


Flight Engineer/Second Officers Fuel System Panel
Figure 3 (Sheet 1)

R
R EFFECTIVITY: 001-024, 027
R
001B



FLIGHT ENGINEER/SECOND OFFICERS STATION
ZONE 215



M1-25001-28-1021

Flight Engineer/Second Officers Fuel System Panel
Figure 3 (Sheet 1)

1 TANK 2L AND 2R INBOARD FUEL QUANTITY SWITCHLIGHT

WHEN SWITCHLIGHT IS RELEASED (OUT), TANK 2L AND 2R FUEL QUANTITY INDICATORS SHOW TOTAL FUEL IN RESPECTIVE TANKS. WHEN DEPRESSED (LATCHED IN), TANK 2L AND 2R INDICATORS SHOW AMOUNT OF FUEL IN TANK 2L AND 2R INBOARD SECTIONS. THE QTY LEGEND IS ILLUMINATED WHEN THE SWITCHLIGHT IS DEPRESSED TO PROVIDE AN INDICATION OF SWITCH POSITION. THE LOW LEGEND IS ILLUMINATED BY A THERMISTOR CONTROLLED FUEL LEVEL SENSING CIRCUIT WHENEVER THE FUEL LEVEL IN THE BOOST PUMP SURGE BOX UNCOVERS THE THERMISTOR (APPROXIMATELY 700 POUNDS OF FUEL REMAINING). THE LOW LIGHT CIRCUIT IS TESTED BY DEPRESSING THE PUSH-TO-TEST SUMP LAMP ON THE 2L AND 2R SIGNAL CONDITIONERS LOCATED IN THE MESC

2 FUEL QUANTITY INDICATOR (4)

INDICATES THE WEIGHT OF FUEL IN RESPECTIVE TANKS 2L, 1, 3, AND 2R. DEPRESSING QUANTITY TEST SWITCH (ITEM 3) WILL DRIVE ALL INDICATOR POINTERS, AND FUEL TOTALIZER (ITEM 4) DIGITAL READOUT, UPSCALE TO TEST INDICATING CIRCUITS

3 QUANTITY TEST SWITCH

SWITCH IS HELD DEPRESSED TO TEST FUEL QUANTITY INDICATORS. ALL QUANTITY INDICATIONS WILL DRIVE UPSCALE AND THEN RETURN TO PREVIOUS INDICATION WHEN SWITCH IS RELEASED

4 FUEL TOTALIZER INDICATOR

PROVIDES DIGITAL READOUT OF TOTAL FUEL WEIGHT AND AIRCRAFT GROSS WEIGHT (AIRCRAFT ZERO FUEL WEIGHT PLUS TOTAL FUEL WEIGHT)

5 FUEL USED RESET SWITCH

MOMENTARILY DEPRESSING SWITCH RESETS FUEL USED INDICATORS ON ENGINE FUEL PANEL

6 REFUEL POWER SWITCHLIGHT

PROVIDES THE FE/SO WITH THE CAPABILITY OF RELEASING THE SOLENOID HELD SYSTEM POWER SWITCH ON THE REFUEL/DEFUELING PANEL AND THEREBY DEACTIVATING THE REFUEL/DEFUELING SYSTEMS. THE SWITCHLIGHT ON LEGEND, WHEN ILLUMINATED, INDICATES THAT THE REFUEL/DEFUELING PANEL IS POWERED. THE ON LIGHT GOES OUT WHEN THE SYSTEM POWER SWITCH RELEASES TO THE OFF POSITION

7 CROSS VALVES SWITCHLIGHTS (3)

WHEN SWITCHLIGHTS ARE DEPRESSED (LATCHED IN), RESPECTIVE FUEL SYSTEM (1X FEED, CX FEED, 3X FEED) CROSSFEED VALVES OPEN. ILLUMINATED BAR LIGHT INDICATES SWITCH IS IN VALVE OPEN POSITION. BLUE DISAGREEMENT LIGHT IS MOMENTARILY ON WHEN VALVE IS IN-TRANSIT TO OPEN OR CLOSE POSITION AND STAYS ON IF VALVE POSITION DOES NOT AGREE WITH SWITCHLIGHT POSITION

8 TANK VALVE SWITCHLIGHTS (3)

WHEN ENG 1, ENG 2, AND ENG 3 TANK VALVE SWITCHLIGHTS ARE DEPRESSED (LATCHED IN), RESPECTIVE FUEL FEED SYSTEM TANK VALVES OPEN. BAR LIGHT ON INDICATES SWITCHLIGHT IS IN OPEN POSITION. BLUE DISAGREEMENT LIGHT COMES ON AT NOTED IN ITEM 7

NOTE

BAR LIGHTS IN ENG 1 AND ENG 3 SWITCHLIGHTS WILL GO OUT IF TANK VALVE IS CLOSED BY ACTUATION OF RESPECTIVE ENGINE FIRE-PULL HANDLE. ENG 2 TANK VALVE IS NOT AFFECTED BY FIRE-PULL HANDLE

9 EMERGENCY SHUTOFF LIGHTS (4)

LIGHT COMES ON ONLY WHEN RESPECTIVE FIREWALL SHUTOFF VALVE IS IN-TRANSIT TO CLOSED OR OPEN POSITION. FIREWALL SHUTOFF VALVES ARE OPERATED BY RESPECTIVE ENGINE FIRE-PULL HANDLES

10 ENGINE FUEL PRESSURE LIGHT (3)

LIGHT INDICATES LOW OUTPUT FROM ENGINE LOW PRESSURE PUMP

11 APU EMERGENCY SHUTDOWN LIGHTS

PRI AND SEC LIGHTS COME ON ONLY WHEN APU PRIMARY AND SECONDARY FIREWALL SHUTOFF VALVES ARE IN-TRANSIT TO OPEN AND CLOSED POSITIONS. A STEADY LIGHT INDICATES THAT SHUTOFF VALVE POSITION DOES NOT AGREE WITH POSITION OF APU FIRE-PULL HANDLE

12 FUEL TEMPERATURE SELECTOR SWITCH

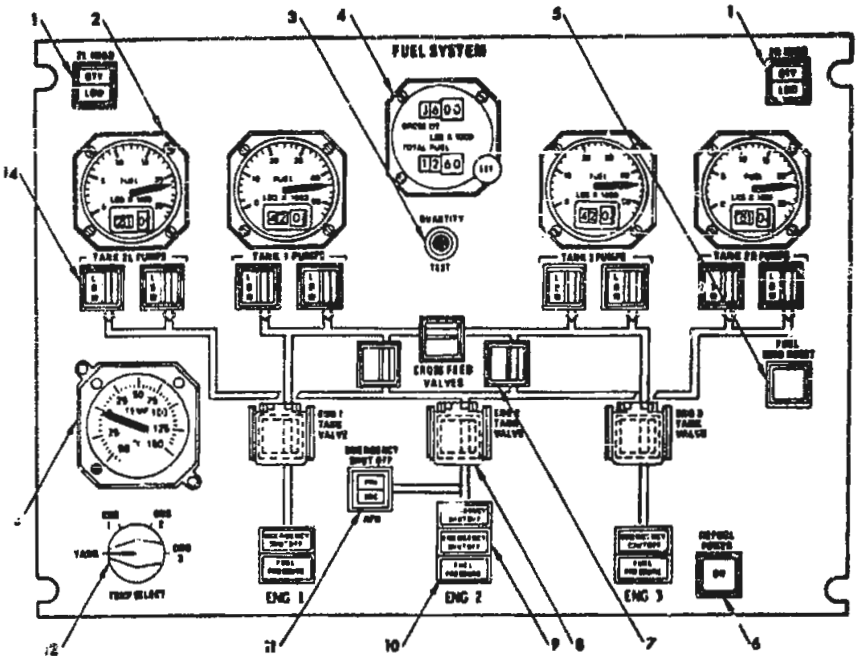
SELECTS TANK 2L OR ENGINE 1, 2, OR 3 FUEL CONTROL INLET TEMPERATURE FOR DISPLAY ON TEMPERATURE INDICATOR

13 FUEL TEMPERATURE INDICATOR

INDICATES TEMPERATURE SELECTED BY TEMP SELECT SWITCH.

14 TANK 2R, 1, 3, AND 2L BOOST PUMP SWITCHLIGHTS (8)

WHEN DEPRESSED (LATCHED IN), SWITCHLIGHT TURNS ON RESPECTIVE TANK BOOST PUMP. BAR LIGHT COMES ON TO INDICATE SWITCHLIGHT POSITION. LOW LEGEND, WHEN ILLUMINATED, INDICATES PUMP OUTPUT PRESSURE IS 6(± 1) PSIG OR LOWER



M1-0002-28-027

Flight Engineer/Second Officers Fuel System Panel
Figure 3 (Sheet 2)

R

R EFFECTIVITY: 001-024, 027

R

0018

1 TANK 2L AND 2R INBOARD AND TANK 1A AND 3A FUEL QTY SWITCHLIGHT

WHEN SWITCHLIGHT IS RELEASED (OUT), TANK 2L, 1, 3, AND 2R FUEL QUANTITY INDICATORS SHOW TOTAL FUEL IN RESPECTIVE TANKS. WHEN DEPRESSED (LATCHED IN), TANK 2L, 1, 3, AND 2R INDICATORS SHOW AMOUNT OF FUEL IN TANK 2L AND 2R INBOARD SECTIONS AND 1A AND 3A FUSELAGE TANKS. THE QTY LEGEND IS ILLUMINATED WHEN THE SWITCHLIGHT IS DEPRESSED TO PROVIDE AN INDICATION OF SWITCH POSITION. THE LOW LEGEND IS ILLUMINATED BY A THERMISTOR CONTROLLED FUEL LEVEL SENSING CIRCUIT WHENEVER THE FUEL LEVEL IN THE BOOST PUMP SURGE BOX UNCOVERS THE THERMISTOR (APPROXIMATELY 700 POUNDS OF FUEL REMAINING FOR TANKS 2L AND 2R, 175 POUNDS FOR TANKS 1A AND 3A). 1A AND 3A LOW LIGHTS ARE DISABLED WHEN 1A AND 3A XFR SWITCHLIGHTS ARE RELEASED. THE LOW LIGHT CIRCUIT IS TESTED BY DEPRESSING THE QUANTITY PUSH-TO-TEST TEST SWITCH OR THE BITE SWITCH AND THE 2L OR 2R SUMP OR THE 1 OR 3 LL LAMP (REF. 28-41-00) ON THE SIGNAL CONDITIONERS LOCATED IN THE MESC

2 FUEL QUANTITY INDICATOR (4 PLACES)

INDICATES THE WEIGHT OF FUEL IN RESPECTIVE TANKS 2L, 1 AND 1A, 3 AND 3A, AND 2R. DEPRESSING QUANTITY TEST SWITCH (ITEM 6) WILL DRIVE ALL INDICATOR POINTERS, AND FUEL TOTALIZER (ITEM 5) DIGITAL READOUT UPSCALE TO TEST INDICATING CIRCUITS (REF. 28-41-00)

3 TANK 1A AND 3A TRANSFER

WHEN SWITCHLIGHT IS RELEASED TANK 1A AND 3A FUEL IS NOT BEING TRANSFERED. TANK 1 AND 3 NORMAL SCAVENGE IS BEING PERFORMED. WHEN SWITCHLIGHT IS DEPRESSED TANK 1A AND 3A TRANSFER VALVE IS OPEN. TANK 1 AND 3 HAVE SURGE BOX SCAVENGE ONLY. XFR LIGHT INDICATES WHEN VALVE CONTROL RELAY HAS ENERGIZED. BLUE DISAGREEMENT LIGHT IS MOMENTARILY ON WHILE VALVES ARE IN-TRANSIT AND STAYS ON IF VALVE POSITIONS DO NOT AGREE WITH SWITCHLIGHT POSITION (REF. 28-11-00 AND 28-27-00)

4 TANK 1A AND 3A GRAVITY TRANSFER SWITCHLIGHT

WHEN SWITCHLIGHT IS DEPRESSED GRAVITY TRANSFER VALVE OPENS AND FUEL IS BEING TRANSFERED TO TANKS 1 OR 3 BY GRAVITY. XFR LIGHT INDICATES SWITCH IS IN VALVE OPEN POSITION, OR THAT MASTER JETTISON SWITCHLIGHT IS DEPRESSED. BLUE DISAGREEMENT LIGHT IS MOMENTARILY ON WHEN VALVE IS IN-TRANSIT TO OPEN OR CLOSE POSITION AND STAYS ON IF VALVE POSITION DOES NOT AGREE WITH SWITCHLIGHT POSITION (REF. 28-27-00)

5 FUEL TOTALIZER INDICATOR

PROVIDES DIGITAL READOUT OF TOTAL FUEL WEIGHT AND AIRCRAFT GROSS WEIGHT (AIRCRAFT ZERO FUEL WEIGHT PLUS TOTAL FUEL WEIGHT) (REF. 28-41-00)

6 QUANTITY TEST SWITCH

SWITCH IS HELD DEPRESSED TO TEST FUEL QUANTITY INDICATORS. ALL QUANTITY INDICATIONS WILL DRIVE UPSCALE AND THEN RETURN TO PREVIOUS INDICATION WHEN SWITCH IS RELEASED (REF. 28-41-00)

7 FUEL USED RESET SWITCH

MOMENTARILY DEPRESSING SWITCH RESETS FUEL USED INDICATORS ON ENGINE FUEL PANEL (REF. 73-34-00)

8 REFUEL POWER SWITCHLIGHT

PROVIDES THE FE/SO WITH THE CAPABILITY OF RELEASING THE SOLENOID HELD SYSTEM POWER SWITCH ON THE FUELING/DEFUELING PANEL AND THEREBY DEACTIVATING THE FUELING/DEFUELING SYSTEMS. THE SWITCHLIGHT ON LEGEND, WHEN ILLUMINATED, INDICATES THAT THE FUELING/DEFUELING PANEL IS POWERED. THE ON LIGHT GOES OUT WHEN THE SYSTEM POWER SWITCH RELEASES TO THE OFF POSITION (REF. 28-21-00)

9 CROSSFEED VALVES SWITCHLIGHTS

WHEN SWITCHLIGHTS ARE DEPRESSED (LATCHED IN), RESPECTIVE FUEL SYSTEM (LX FEED, CX FEED, RX FEED) CROSSFEED VALVES OPEN. FLOWBAR INDICATES SWITCH IS IN VALVE OPEN POSITION. BLUE DISAGREEMENT LIGHT IS MOMENTARILY ON WHEN VALVE IS IN-TRANSIT TO OPEN OR CLOSE POSITION AND STAYS ON IF VALVE POSITION DOES NOT AGREE WITH SWITCHLIGHT POSITION (REF. 28-26-00)

10 TANK VALVE SWITCHLIGHTS (3 PLACES)

WHEN ENG 1, ENG 2, AND ENG 3 TANK VALVE SWITCHLIGHTS ARE DEPRESSED (LATCHED IN), RESPECTIVE FUEL FEED SYSTEM TANK VALVES OPEN. FLOWBAR INDICATES SWITCHLIGHT IS IN OPEN POSITION. BLUE DISAGREEMENT LIGHT COMES ON AS NOTED IN ITEM 9 (REF. 28-24-00)

NOTE

FLOWBAR IN ENG 1 AND ENG 3 SWITCHLIGHTS WILL GO OFF IF RESPECTIVE TANK VALVE IS CLOSED BY ACTUATION OF RESPECTIVE ENGINE FIRE-PULL HANDLE. ENGINE 2 TANK VALVE IS NOT AFFECTED BY FIRE-PULL HANDLE

11 EMERGENCY SHUTOFF LIGHTS (4 PLACES)

LIGHT COMES ON ONLY WHEN RESPECTIVE FIREWALL SHUTOFF VALVE IS IN-TRANSIT TO CLOSED OR OPEN POSITION. FIREWALL SHUTOFF VALVES ARE OPERATED BY RESPECTIVE ENGINE FIRE-PULL HANDLES (REF. 28-24-00)

12 ENGINE FUEL PRESSURE LIGHT (3 PLACES)

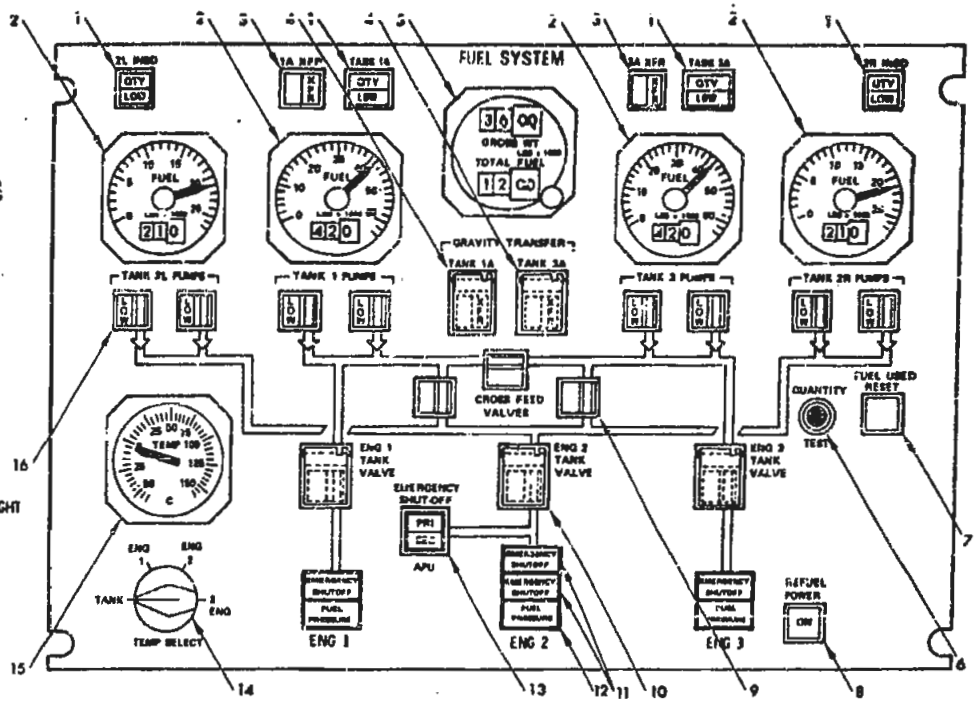
LIGHT INDICATES LOW OUTPUT FROM ENGINE LOW PRESSURE PUMP (REF. 73-31-00)

13 APU EMERGENCY SHUTDOWN LIGHTS

PRI AND SEC LIGHTS COME ON ONLY WHEN APU PRIMARY AND SECONDARY FIREWALL SHUTOFF VALVES ARE IN-TRANSIT TO OPEN OR CLOSED POSITIONS. A STEADY LIGHT INDICATES THAT SHUTOFF VALVE POSITION DOES NOT AGREE WITH POSITION OF APU FIRE-PULL HANDLE (REF. 28-25-00)

14 FUEL TEMPERATURE SELECTOR SWITCH

SELECTS TANK 2L OR ENGINE 1, 2, OR 3 FUEL CONTROL INLET TEMPERATURE FOR DISPLAY ON TEMPERATURE INDICATOR (REF. 73-37-00)



15 FUEL TEMPERATURE INDICATOR

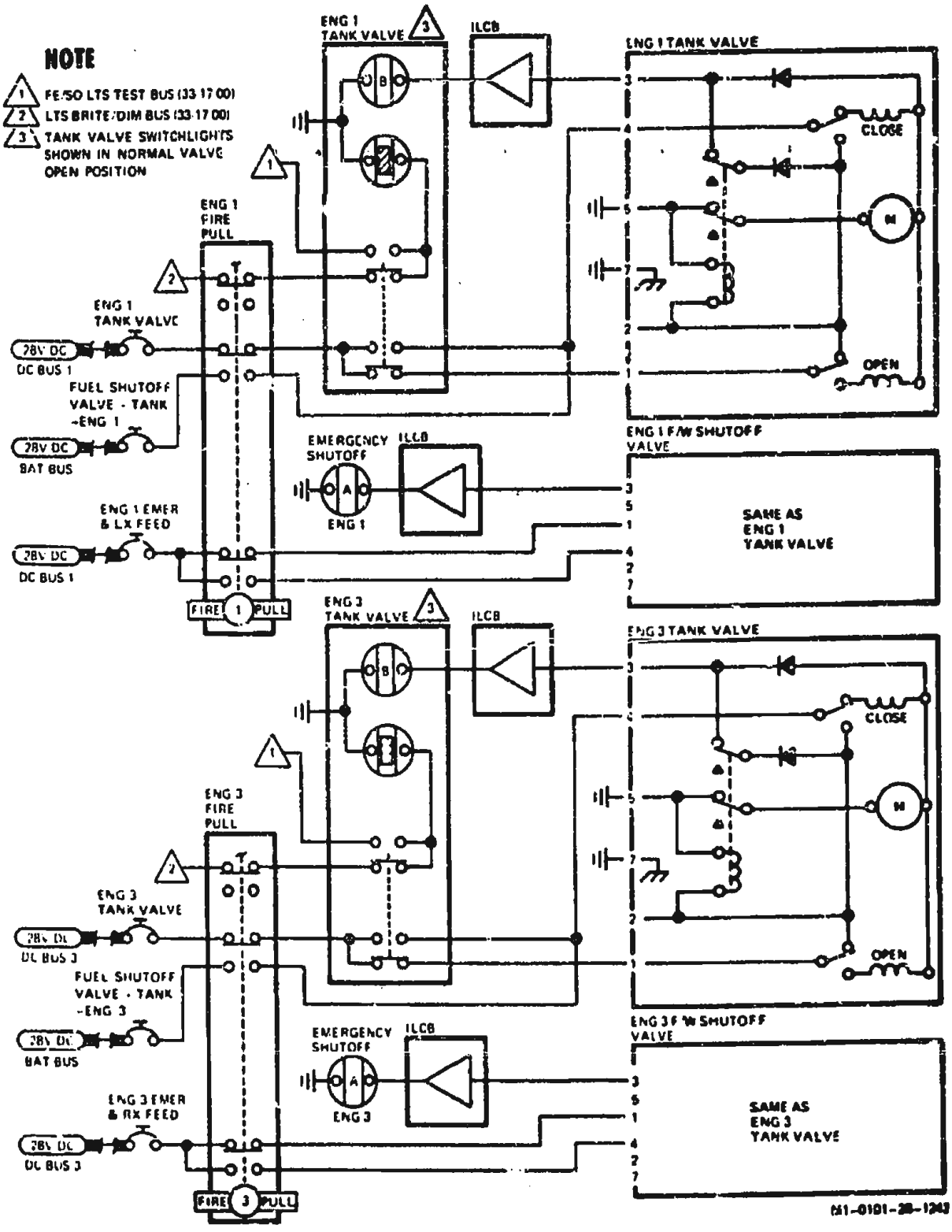
INDICATES TEMPERATURE SELECTED BY TEMP SELECT SWITCH (REF. 73-37-00)

16 TANK 2L, 1, 3, AND 2R BOOST PUMP SWITCHLIGHTS (8 PLACES)

WHEN DEPRESSED (LATCHED IN), SWITCHLIGHT TURNS ON RESPECTIVE TANKS BOOST PUMP. FLOWBAR IS ILLUMINATED TO INDICATE PUMP IS ENERGIZED. LOW LEGEND, WHEN ILLUMINATED, INDICATES PUMP OUTPUT PRESSURE IS 6 (±1) PSIG OR LOWER (REF. 28-24-00)

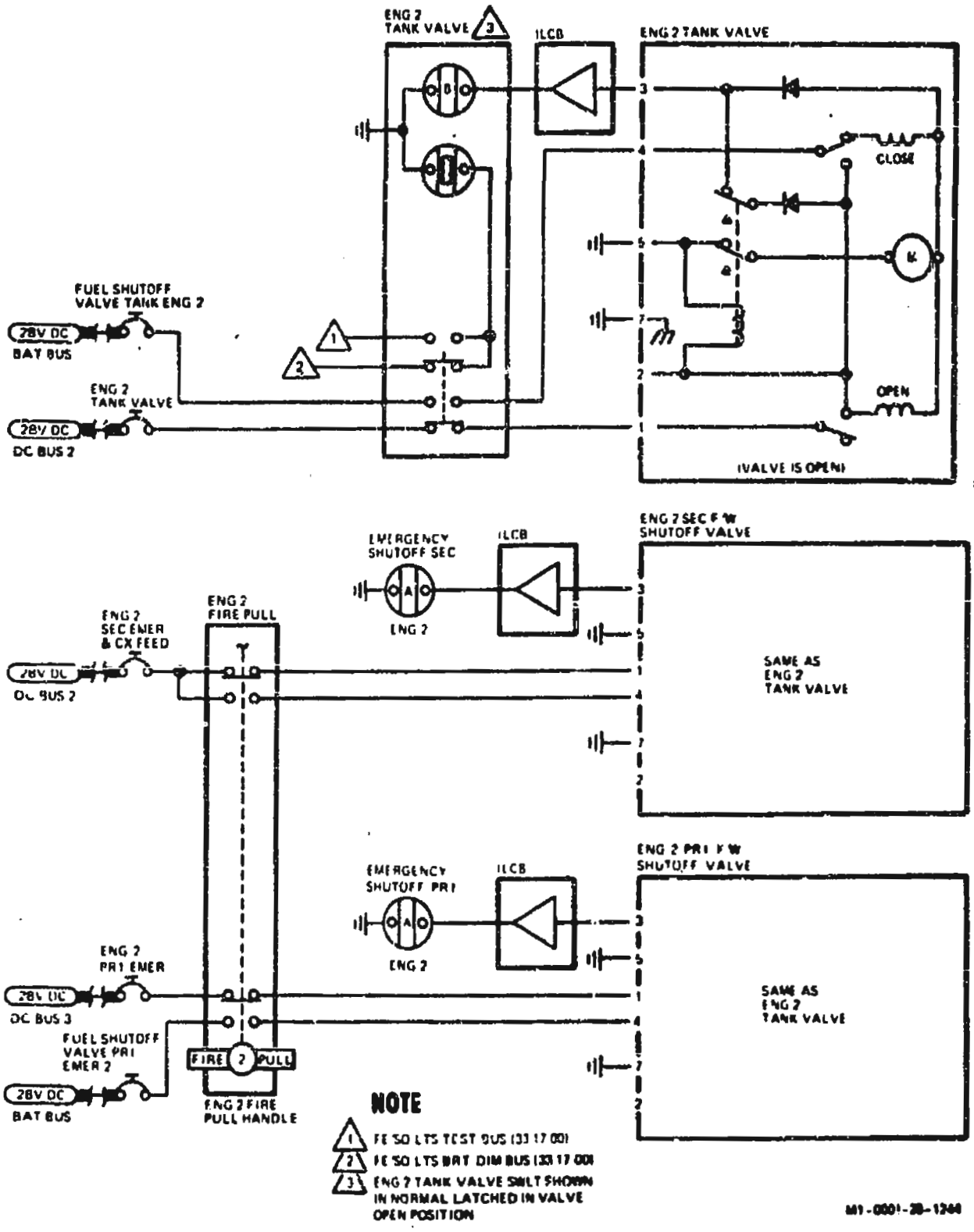
M1-25002-28-1077

Flight Engineer/Second Officers Fuel System Panel
Figure 3 (Sheet 2)



Engine 1 and 3 Fuel Feed System Simplified Schematic
Figure 4

R


ENG 2 TANK VALVE
ILCB
ENG 2 TANK VALVE
CLOSE
OPEN
K
FUEL SHUTOFF VALVE TANK ENG 2
28V DC BAT BUS
ENG 2 TANK VALVE
28V DC DC BUS 2
(VALVE IS OPEN)
EMERGENCY SHUTOFF SEC
ENG 2
ENG 2 SEC F W SHUTOFF VALVE
ENG 2 SEC EMER & CX FEED
ENG 2 FIRE PULL
SAME AS ENG 2 TANK VALVE
EMERGENCY SHUTOFF PRI
ENG 2 PRI F W SHUTOFF VALVE
ENG 2 PRI EMER
28V DC DC BUS 3
FUEL SHUTOFF VALVE PRI EMER 2
FIRE 2 PULL
ENG 2 FIRE PULL HANDLE
NOTE
1 FE SO LTS TEST BUS (33 17 00)
2 FE SO LTS BAT DIM BUS (33 17 00)
3 ENG 2 TANK VALVE SHUT SHOWN IN NORMAL LATCHED IN VALVE OPEN POSITION
M1-0001-28-1244

Engine 2 Fuel Feed System Simplified Schematic
Figure 5

R

EFFECTIVITY: ALL

001B

a ground is applied to the RCCB which is energized and allows power to be applied to the pump motor. The white ON light comes on when the switchlight is depressed to start the pump. The low light comes on momentarily.

The outboard boost pump elements in fuel tanks 2L and 2R are deenergized when the ground service bus is being used (Ref. 24-41-00).

R

2. Fuel Boost Pump

A. Description and Operation

Each fuel boost pump consists of two plug-in centrifugal pump and motor assemblies; two discharge check valve assemblies and a housing assembly (Ref. Fig. 7 and 8).

The two pump and motor assemblies operate on 115V ac, 400-Hz, 3-phase power and may be used singly or in pairs as required.

Both the main discharge port and the motive flow port are common to the two boost pumps.

With both pumps shut down, line pressure at the main and motive flow ports is maintained by the discharge check valves. The check valves are of the cartridge type to facilitate removal as a unit for servicing.

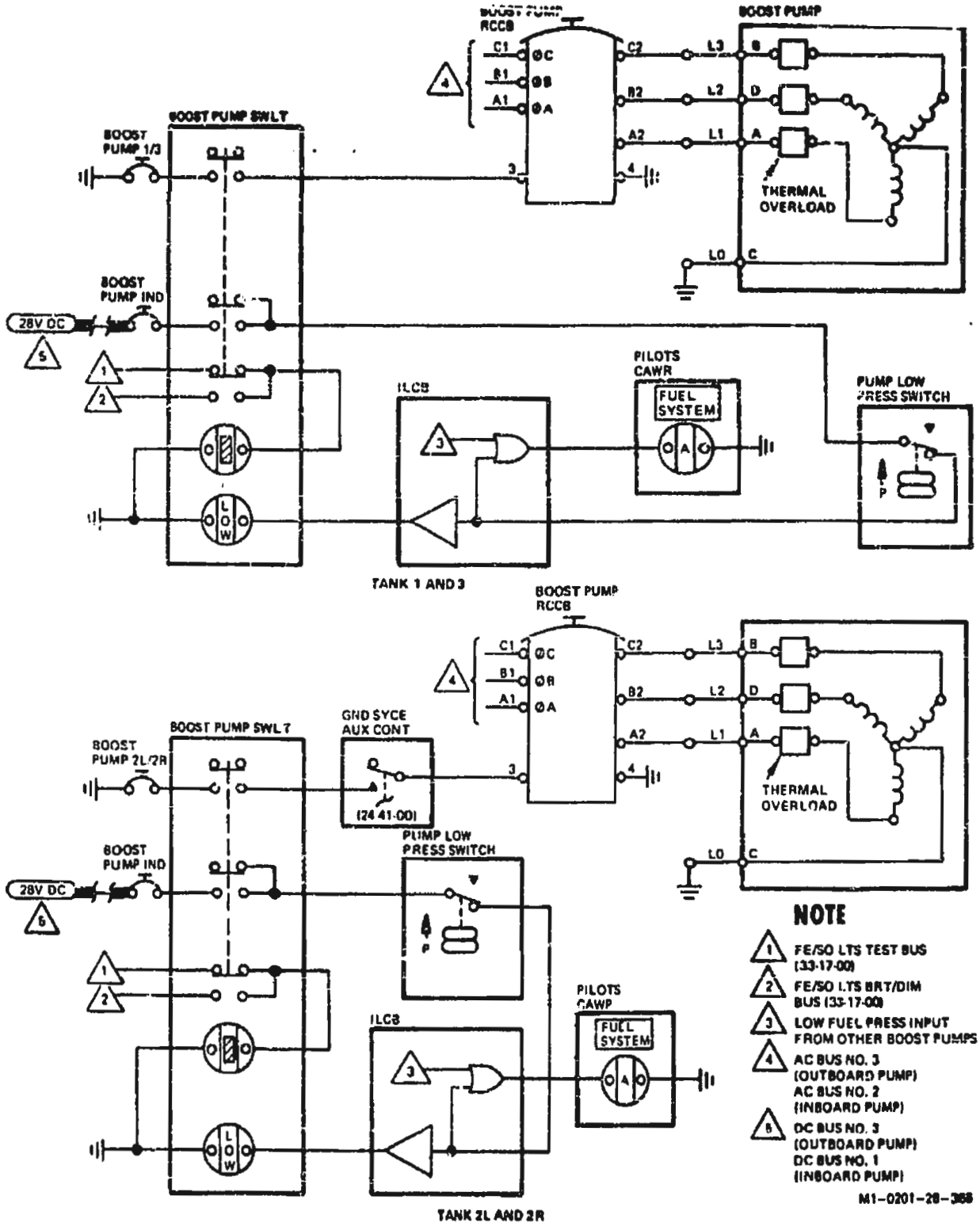
The pump and motor assemblies can be removed from the housing assembly for replacement without draining the fuel from the tank in which the unit is mounted. Removal of a discharge check valve assembly will necessitate draining of the tank.

Electrical connections are disconnected and fuel inlet ports are closed automatically during removal of a pump and motor assembly from the housing. The boost pump unit is designed to insure positive alignment of assemblies during installation.

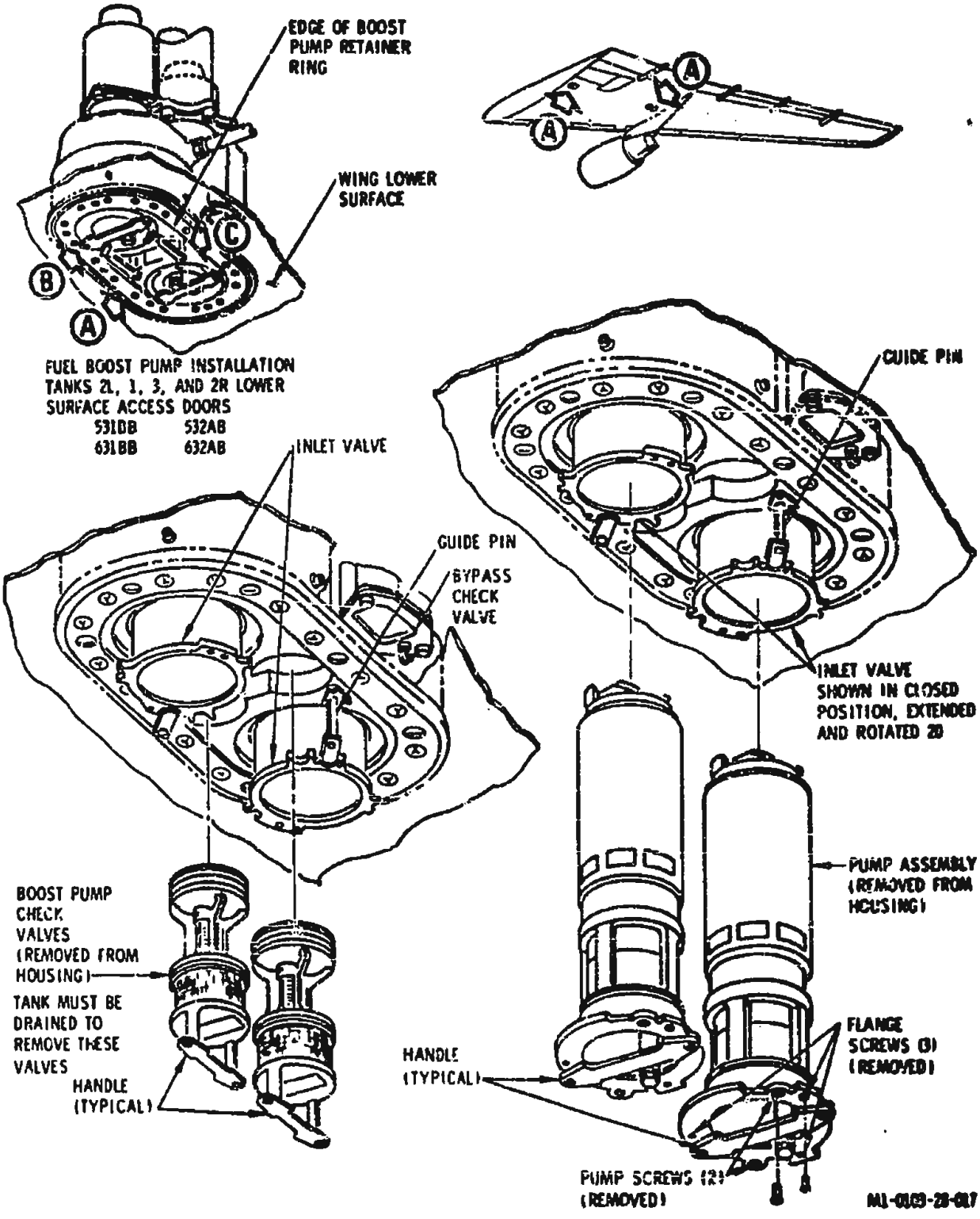
3. Fuel Tank and Fuel Feed Line Shutoff Valves

A. Description

Fuel Tank shut-off (tank isolation) valves are installed in the No. 1 and No. 3 engine fuel feed lines at the location where the lines are routed through the wing forward spar and enter the engine pylons (Ref. Fig. 1 and 2). Engine No. 2 tank shutoff valve is on the wing center section aft beam



C C Fuel Boost Pumps Simplified Schematic
Figure 6

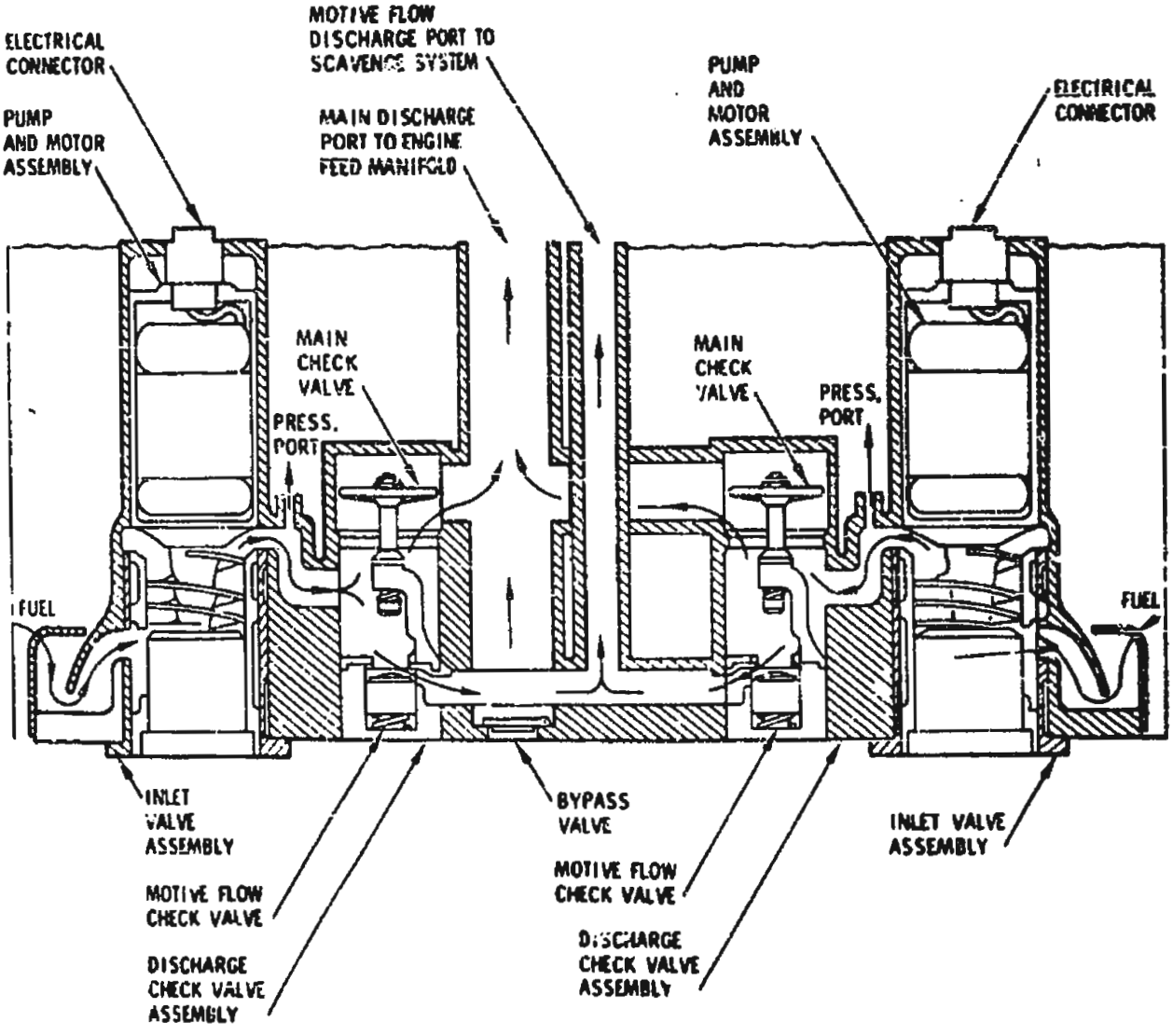


Fuel Boost Pump
Figure 7

R

EFFECTIVITY: ALL

001B



M1-0100-28-741

Boost Pump Flow Schematic
Figure 8

R

EFFECTIVITY: ALL

0016

between the fuel equalizer outlet line and the No. 2 engine fuel feed line in the hydraulic service center (Ref. Fig. 1 ,2 and 10). These valves are primarily fuel tank isolation (or fuel line shutoff) valves and are identified on the FE/SO Fuel System panel as ENG 1, ENG 2, and ENG 3 TANK VALVES. (Ref. Fig. 3). They are primarily fuel system management valves, and are electrically controlled by appropriately identified switchlights on the panel. Valve open position is indicated by illuminated flow bars in the panel switchlight lenses. Engine 1, 2, 3, emergency (firewall) shutoff valves are installed in each engine fuel feed line; one each at the No. 1 and No. 3 engine pylon firewalls, and two, in series, at the No. 2 engine firewall in the afterbody area above the horizontal stabilizer (Ref. Fig 1 and 2). These valves are normally open emergency fuel shutoff valves and are electrically closed by the appropriate ENG 1, ENG 2 and ENG 3 FIRE PULL handles. Valve closed position is indicated when the appropriately identified advisory light on the FE/SO panel is illuminated.

All of the above valves are basically identical units, consisting of valve housing containing a rotary sleeve valve which, when rotated, shuts off the housing fuel inlet and outlet parts, and a plug-in-element consisting of an electrical actuator and a cylindrical plug valve (Ref. Fig. 10).

With the plug-in-element inserted into the housing and locked in place the cylindrical plug is rotated by the actuator to an in-line or out-of-line position with the fuel inlet and outlet ports in the valve housing to either allow or shutoff fuel flow. Line replacement of the plug-in-element without loss of fuel is facilitated by the design of the unit which indexes the element to the housing sleeve valve in a manner that requires a 90 degree rotation of the element to close the sleeve valve before the element can be extracted from the housing. Conversely, during installation, rotation of the element to its locked position, rotates the sleeve valve into alignment with fuel parts in the housing.

Engine 2 primary and secondary emergency fuel shutoff valves are identical units consisting of an electrically operated actuator and a valve body which houses a ball type shutoff valve. Mounting bosses on the valve body are provided for securing the assembly on a support bracket attached to the fuselage station 1860 bulkhead.

B. Operation

Each of the valve actuators contain a reversible motor, a gear train and a roller-type clutch. Cam operated switches

(Ref. Fig. 5) Limit output shaft rotation to 90 degrees in both clockwise and counterclockwise directions at which point the clutch disengages the actuator output shaft and allows the motor to coast to a stop. An isolation relay is used to prevent operation of the actuator if voltage is applied to the previously energized motor circuit. An output voltage existing at pin 3 of the actuator electrical connector is used to provide a flight station disagreement light indication if the actuator position is not in agreement with the selected valve control circuit. This circuit remains active whenever the valve is in-transit to provide a flight station indication of valve response to the selected position. A manual override lever, operated by the actuator output shaft, provides a mechanical indication of valve position and may be used to manually operate the valve in either direction.

Fuel is supplied to the APU through a fuel line tapped into the ENG 2 fuel supply line and two in-line primary and secondary fuel shutoff valves similar to the ENG 2 fuel shutoff valves.

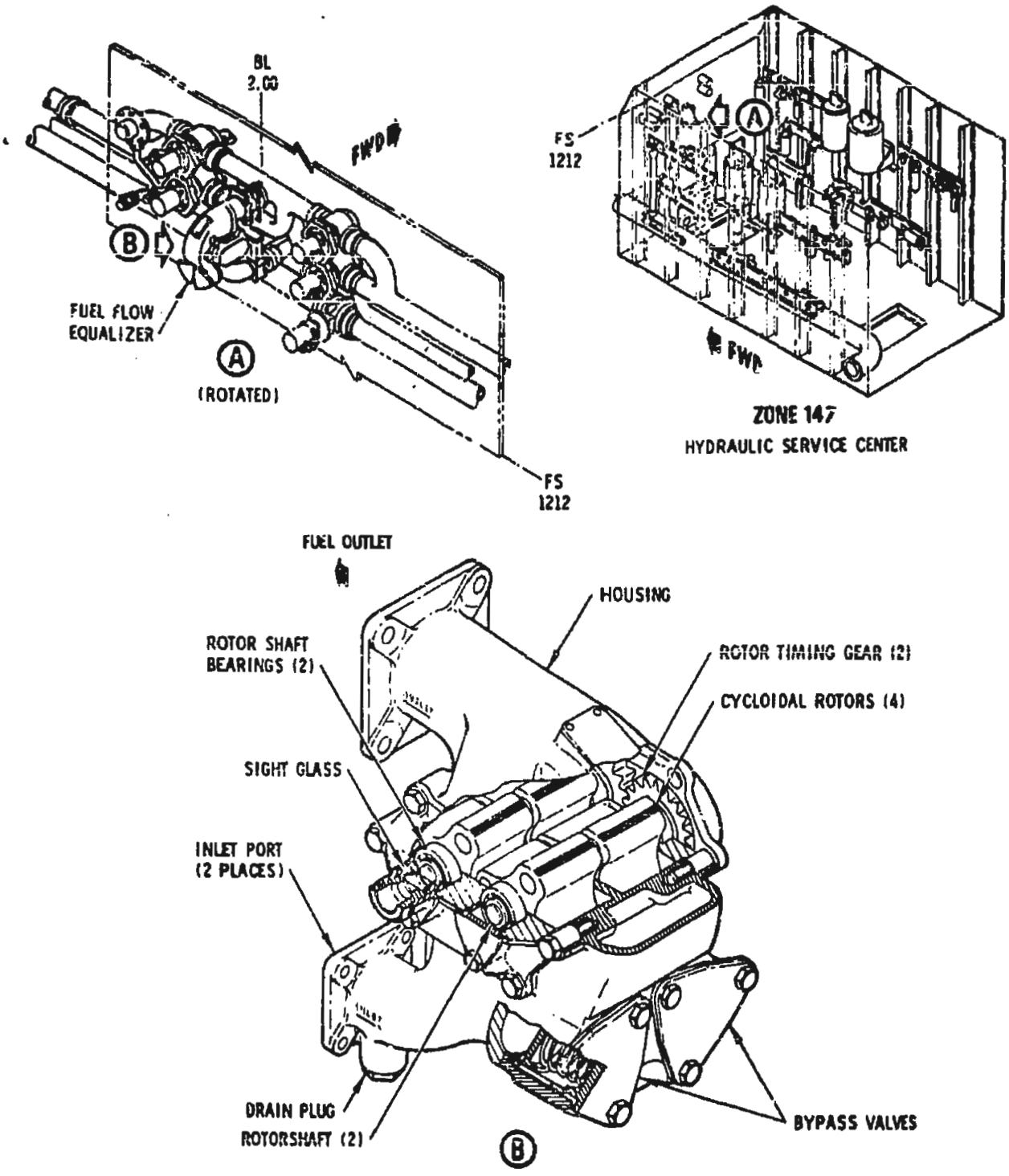
An emergency shutdown using an APU FIRE PULL handle opens the 28V dc power circuit to the shutoff valve open coils and applies 28V dc to the valve close coils. The valves will also be closed in the same manner if an automatic fire shutdown signal is applied to the APU No. 1 and No. 2 AUTO SHUTDOWN relays (2611-K4 and 2611-K5). In this case the circuit is switched in the contacts of the relays and not the fire pull handle switches.

4. Fuel Flow Equalizer

A. Description and Operation

The fuel flow equalizer (Ref. Fig. 9) is located on the wing aft beam in the hydraulic service center. Fuel is supplied at boost pump pressure from the outboard wing tanks. Fuel flow is controlled by the equalizer to ensure that an equal amount of fuel is drawn from each tank over the same period of time. The two fuel flows merge after passing the cycloidal proportioning rotors of the equalizer and is delivered to engine No. 2.

Two identical and parallel shafts, each machined with a timing gear, operate a pair of identical cycloidal rotors. The rotors are keyed to the shafts and maintain correct interaction phasing by the gear action. One shaft end is visible through an inspection window to check for shaft rotation purposes.



Fuel Flow Equalizer
Figure 9

Two spring-loaded bypass valves are incorporated in chambers located at the outlet passages in the equalizer housing. The bypass valves are connected by a passage to a single outlet and remains closed during normal operation. The valve components are accessible through cover plates in the housing.

The flow equalizer cells are identical, and merge fuel flow on the outlet side of the rotors.

Fuel at boost pump pressure is fed from a wing tank to one inlet port of the equalizer. Rotors regulate the rate of flow as fuel moves through the rotor cell to the discharge ports.

Fuel from both outboard tanks passes through both cells in the same manner. Since the parallel rotors are geared to rotate at the same speed, the total volume of fuel transferred by each pair of rotors is identical. In the event of a rotor seizure, the decreased pressure in both cells will cause the by-pass valves to open allowing unproportioned fuel to flow through the bypass passage to the discharge port.

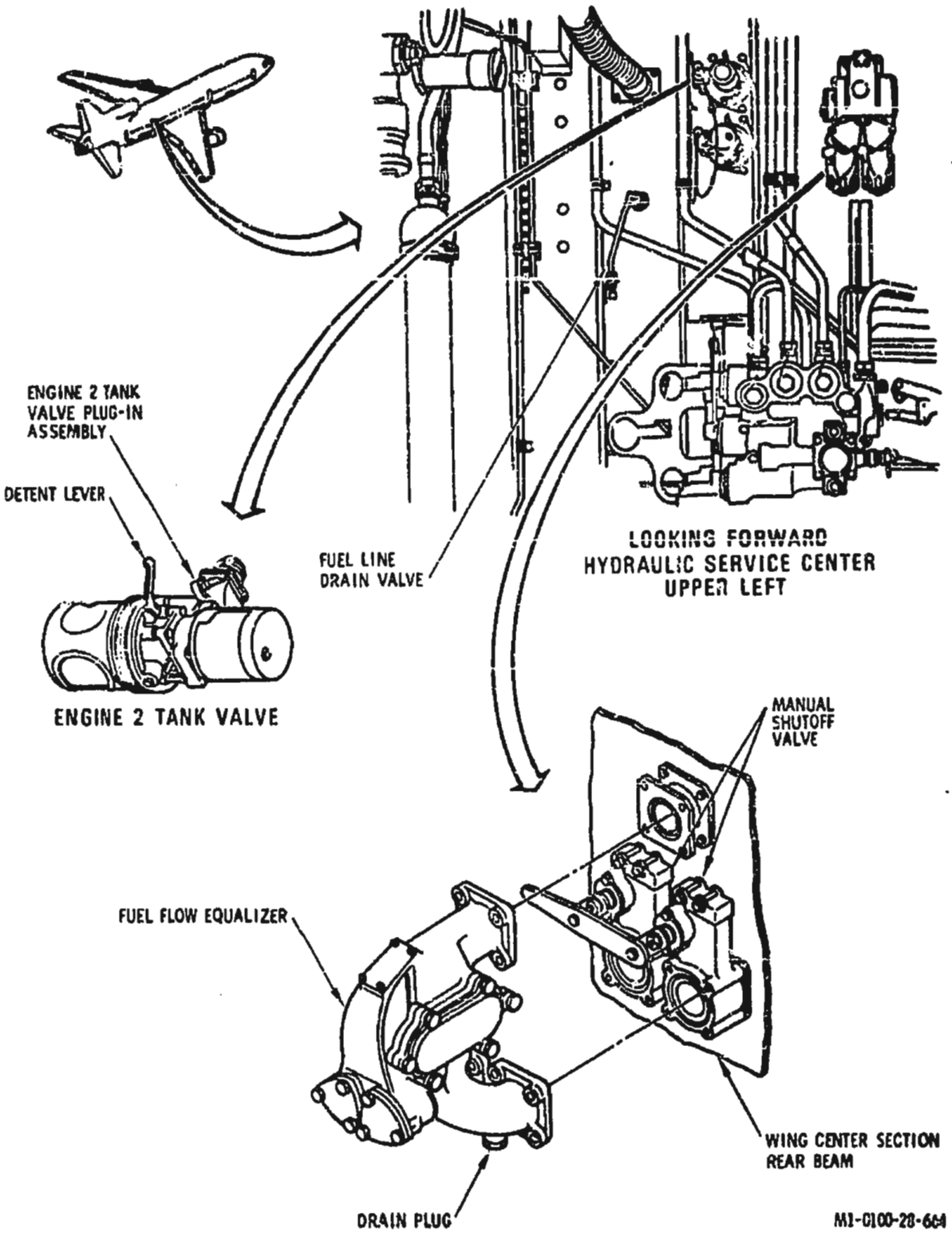
If one inlet port becomes exposed to air while the other inlet port is supplied with fuel it will tend to cause them to revolve in a reverse direction. This will have the same effect as seized rotors. In this condition, the pressure drop across the rotors on the active side will cause the by-pass valves to open and supply fuel to the engine. Seepage past the rotors exposed to air will enter the inlet line to the system check valve. This gives protection against further entry of air and also prevents fuel from flowing back to an empty tank.

5. Manual Shutoff Valve

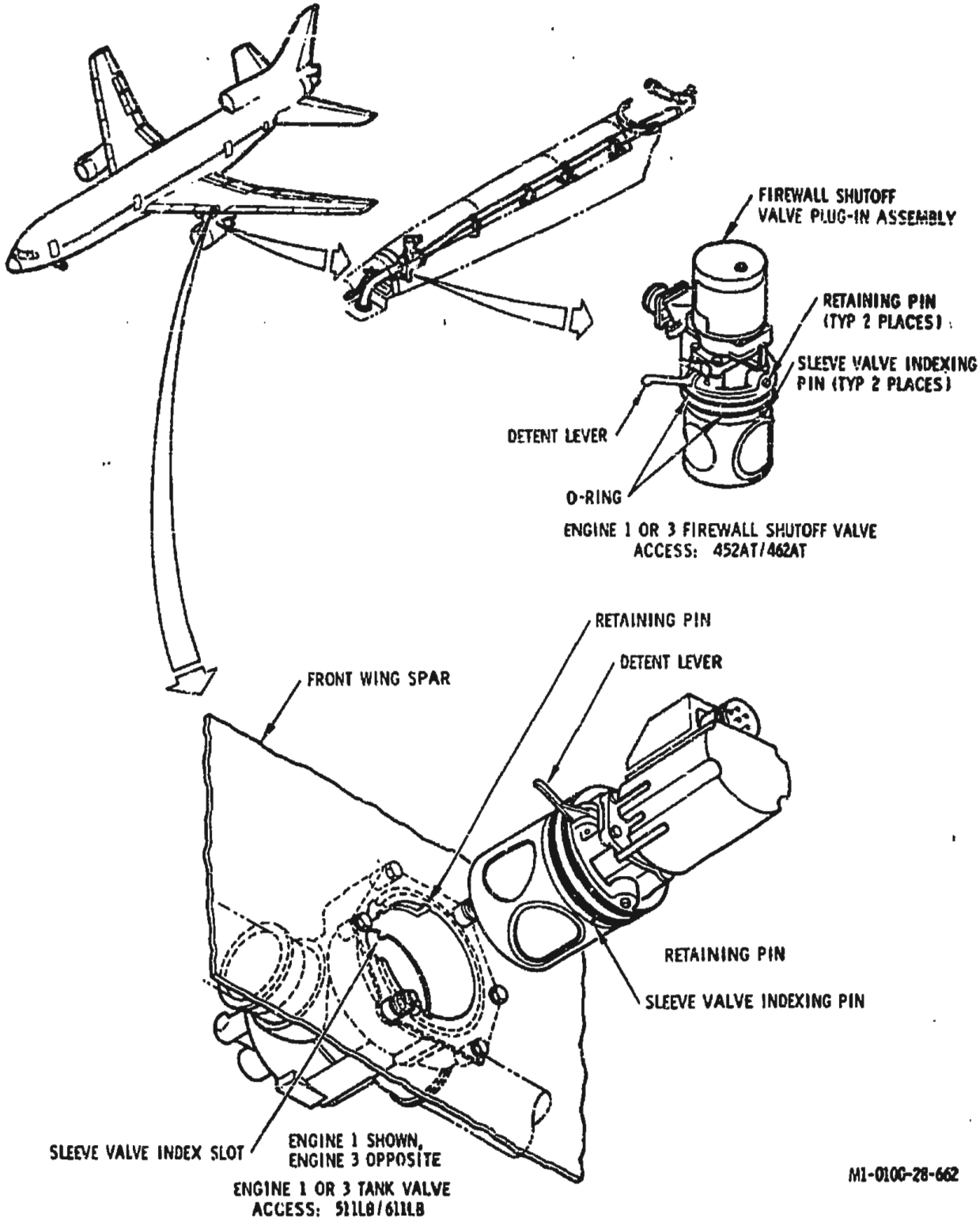
A. Description and Operation

The manual shutoff valve (Ref. Fig. 10) uses a sliding gate as the primary valving element. The valve is used in pairs attached to the two fuel flow equalizer inlet ports. The two valves are connected by a link bar for parallel operation.

To minimize gate operating torque, a metal bushing with a Rulon race is used at the upper end of the shaft. This assures adequate support of the shaft during actuation of the operating link bar. The operating link bar is normally lock-wired in the open position.



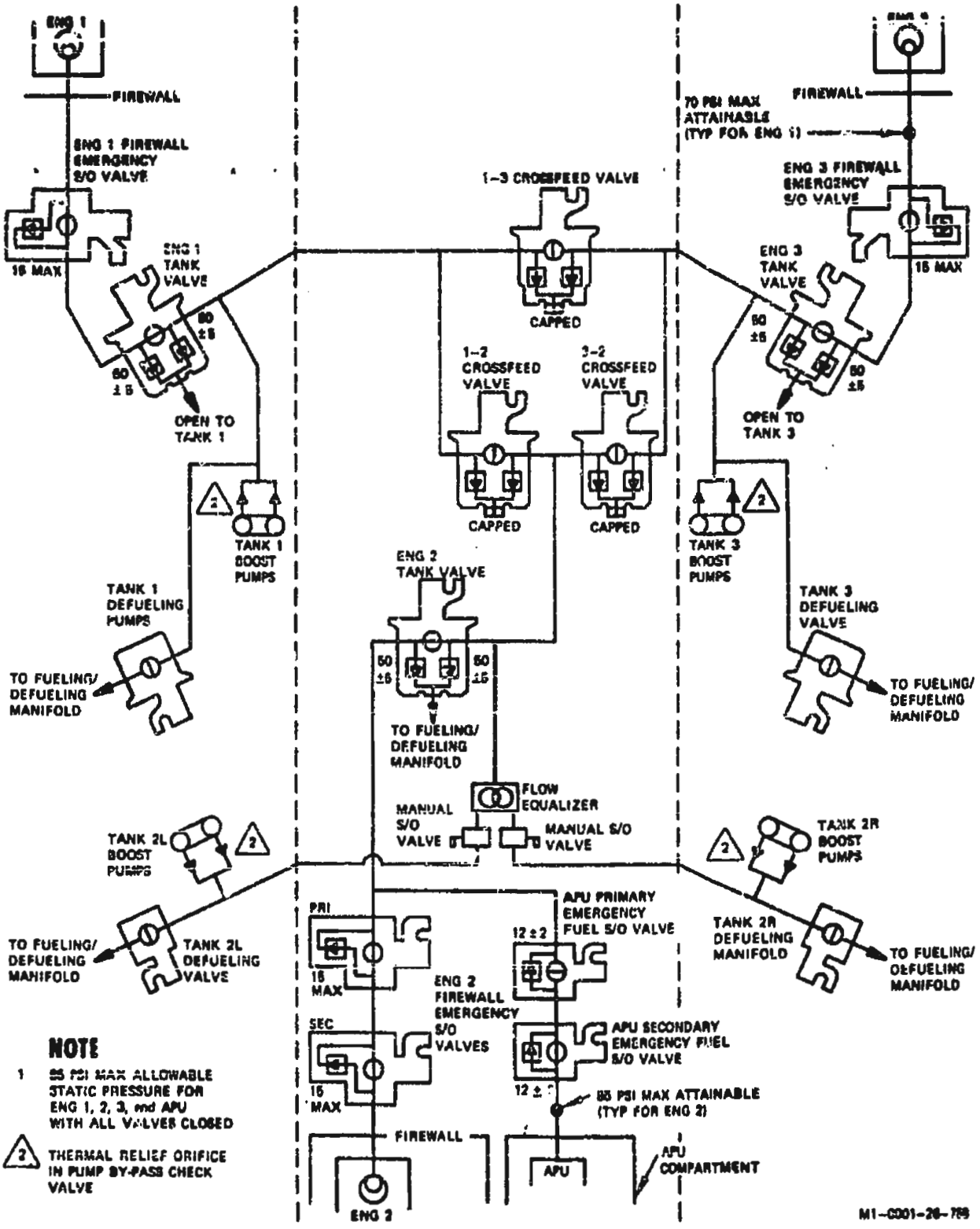
Manual Shutoff and Engine No. 2 Tank Valve
Figure 10


FIREWALL SHUTOFF VALVE PLUG-IN ASSEMBLY
RETAINING PIN (TYP 2 PLACES)
SLEEVE VALVE INDEXING PIN (TYP 2 PLACES)
DETENT LEVER
O-RING
ENGINE 1 OR 3 FIREWALL SHUTOFF VALVE ACCESS: 452AT/462AT
RETAINING PIN
DETENT LEVER
FRONT WING SPAR
RETAINING PIN
SLEEVE VALVE INDEXING PIN
SLEEVE VALVE INDEX SLOT
ENGINE 1 SHOWN, ENGINE 3 OPPOSITE
ENGINE 1 OR 3 TANK VALVE ACCESS: 511LB/611LB
M1-0100-28-662

Engine 1 and 3 Tank Valve and Firewall Shutoff Valves
Figure 11

6. Thermal Relief

R Thermal relief bypass valves are included in the engine No.1,
R engine No. 2, and engine No. 3 tank valves (Ref. Fig. 12).
R These valves allow any expanding fuel to escape back into the
R tanks and keep the maximum pressure in the lines below 85 psi.
R Engine No. 1 and engine No. 3 tank valves are vented directly to
R tanks 1 and 3, respectively. A tube connected to the engine No.
R 2 tank valve thermal relief port vents fuel to the refuel/defuel
R manifold left of the manifold isolation valve. The vented fuel
R then flows into tank 1 through the refuel/defuel manifold drain
R valve.



Thermal Relief Schematic
Figure 12

ENGINE FEED SYSTEM - FAULT ISOLATION

1. General

Reference data and fault isolation procedures for troubleshooting engine feed system faults are included in this section of the manual. An engine fuel feed system malfunction detected by the flight crew is normally entered in the aircraft flight log book and reported to maintenance personnel by a FIRM fault code number. This number and the flight log book write-up can be found in the Chapter 28 Fault Code Index. The index specifies the maintenance manual section, fault isolation diagram figure number and, where appropriate, a block number indicating the diagram entry point containing the fault isolation procedure. When no block number is specified, the diagram entry point is block 1.

Prerequisites listed at the top of each diagram identify mandatory preliminary steps and circuit breakers that must be closed before initiating any fault isolation step.

Schematic diagrams, identified by a SCHEM number, supplement fault isolation procedures as maintenance aids. The schematics show the basic system circuitry necessary for troubleshooting and include cross-reference indexes to the wiring diagram manual pages required for checking component interconnect wiring.

2. Fault Isolation

CR A. Fuel Boost Pump RCCB Fault Isolation

CR If an RCCB fails to respond to the control switch or the
CR remote trip/set circuit breaker, check the security and
CR termination of the control wires in contacts 3 and 4 of the
CR RCCB connection block. Pin 4 must be connected directly to
CR circuit ground and pin 3 is grounded to close the RCCB and
CR open to trip the RCCB. The RCCB connection block has two
CR holes for contacts 3 and 4 and should have only one wire in
CR contact 3 and one in 4. Connect an ohmmeter between the
CR open hole of 4 and circuit ground and verify the RCCB has a
CR good ground. Connect the ohmmeter between the open hole of
CR 3 and circuit ground and verify ground when the control
CR switch is closed and open when the switch is open

Table 101 is a list of fault isolation data in this section of the manual.

R Fault Isolation Data
R Table 101

R FIGURE NUMBER	TITLE
R 101	Component Location Index
R 102	Component Locator
R 103	TANK 1 or 3 PUMPS LOW Light On
R 104	TANK 2L or 2R PUMPS LOW Light On
R 105	TANK PUMPS Flowbar Problems
R 105	ENG 1 or 3 EMERGENCY SHUTOFF Amber Disagreement Light Problems
R 107	ENG 2 EMERGENCY SHUTOFF Amber Disagreement Light Problems
R 108	ENG 1 or 3 TANK VALVE Blue Disagreement Light Problems
R 109	ENG 2 TANK VALVE Blue Disagreement Light Problems
R 110	ENG 1 or 3 TANK VALVE Flowbar Problems
R 111	ENG 2 TANK VALVE Flowbar Problems
R 112	Tanks 1 or 3 Fuel Quantity Slowly Increasing or Not Decreasing Normally
R 113	Tanks 2L or 2R Fuel Quantity Slowly Increasing or Not Decreasing Normally
R SCHEM 1	Tank 1 Boost Pumps Schematic
R SCHEM 2	Tank 2L Boost Pumps Schematic
R SCHEM 3	Tank 2R Boost Pumps Schematic
R SCHEM 4	Tank 3 Boost Pumps Schematic
R SCHEM 5	ENG 1 Fuel Feed Schematic
R SCHEM 6	ENG 2 Fuel Feed Schematic
R SCHEM 7	ENG 3 Fuel Feed Schematic

COMPONENT	QTY	AREA/ACCESS	REFERENCE
ACTUATOR:			
CROSSFEED VALVE	3	HSC/147AB	28-26-03
ENG 1 & 3 F/W SHUTOFF	2	1 & 3 PYLON/452AT, 462AT	28-24-09
ENG 2 F/W SHUTOFF PRI & SEC	2	AFTERBODY/316CB	28-24-09
FUEL FLOW EQUALIZER	1	HYD SVCE CTR/147AB	28-24-13
PANEL, FUEL SYSTEM	1	FE/EO CONSOLE/FLT STA	28-00-10
PUMP AND MOTOR, FUEL BOOST	8	PUMP HSG/531BB, 631BB, 532AB, 632AB	28-24-02
SWITCH:			
2L, 1, 3, 2R PUMPS	8	FUEL SYS PNL/FLT STA	*
ENG 1, 2, 3 TANK VALVE	3	FUEL SYS PNL/FLT STA	*
ENG 1, 2, 3 EMERGENCY SHUTOFF	4	FUEL SYS PNL/FLT STA	*
CROSSFEED VALVES	3	FUEL SYS PNL/FLT STA	*
LOW PRESS, TANK 1, 3 BOOST PUMP	4	WING TE/541AB, 641AB	28-44-01
LOW PRESS, TANK 2L, 2R BOOST PUMP	4	WING TE/541GB, 641GB	28-44-01
VALVE:			
CROSSFEED	3	HSC/147AB	28-26-01
ENG 1 & 3 F/W SHUTOFF	2	1 & 3 PYLON/452AT, 462AT	28-24-07
ENG 2 F/W SHUTOFF PRI & SEC	2	AFTERBODY/316CB	28-24-10
MANUAL SHUTOFF, TANK 2L & 2R	2	HSC/147AB	28-24-19
CHECK FUEL BOOST PUMP	8	PUMP HSG/531BB, 631BB, 532AB, 632BB	28-24-03
TANK, ENG 1 & 3 PLUG-IN ASSY	2	WING, LE/511B-1, 611B-1	28-24-15
TANK, ENG 2 PLUG-IN ASSY	1	HSC/147AB	28-24-15

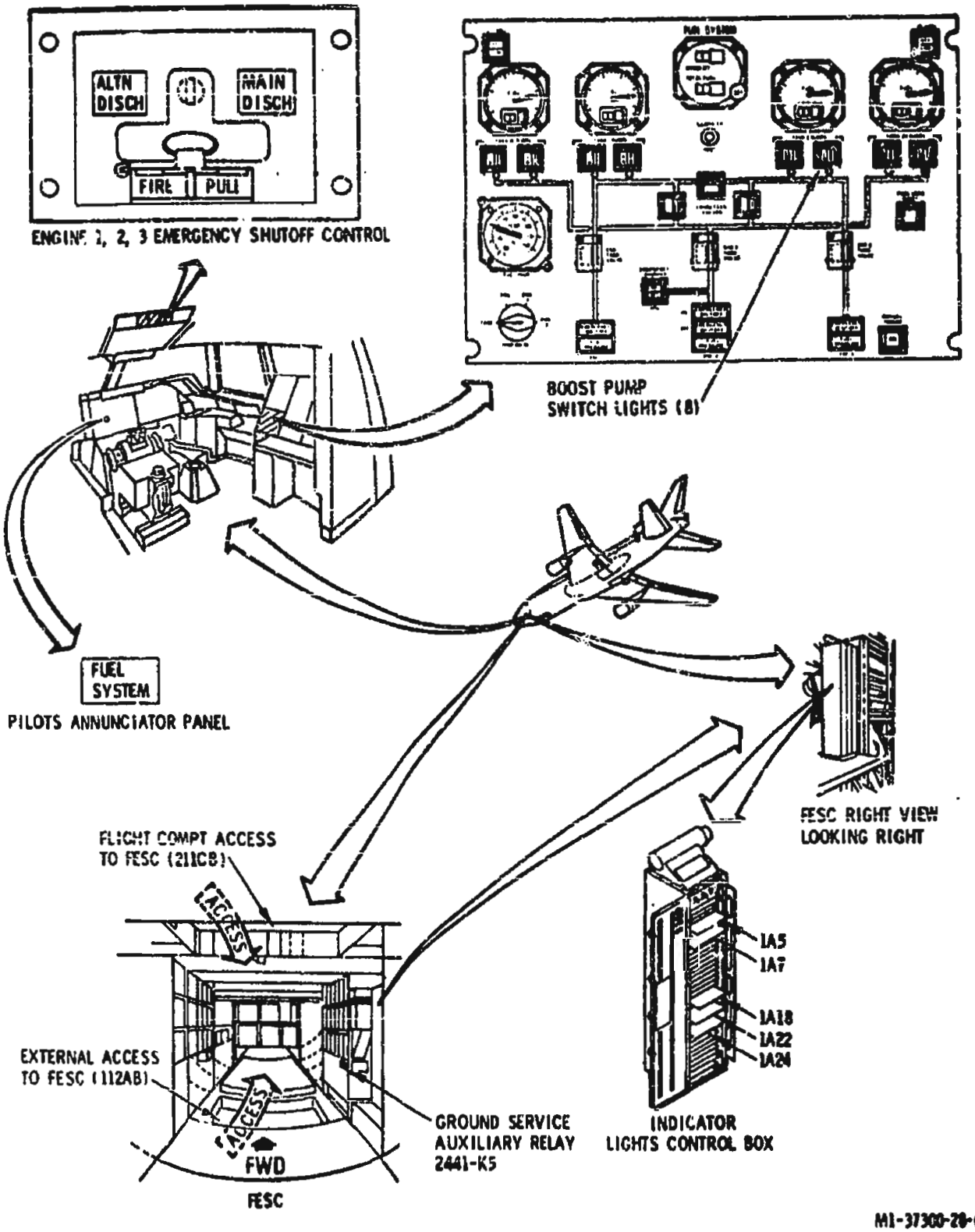
*SEE WM EQUIPMENT LIST

M1-0001-28-1487

R Component Location Index
R Figure 101

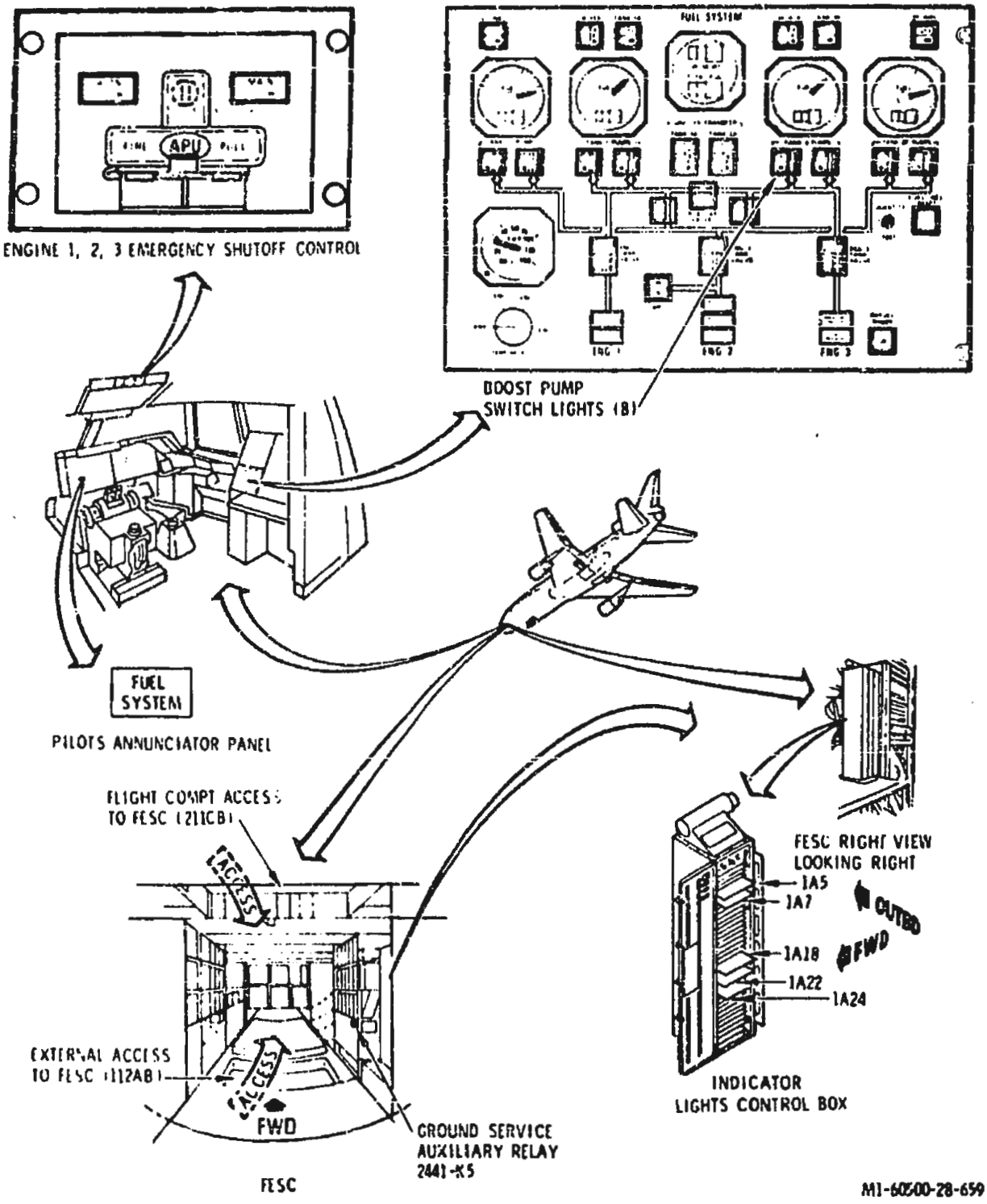
EFFECTIVITY: ALL

001B

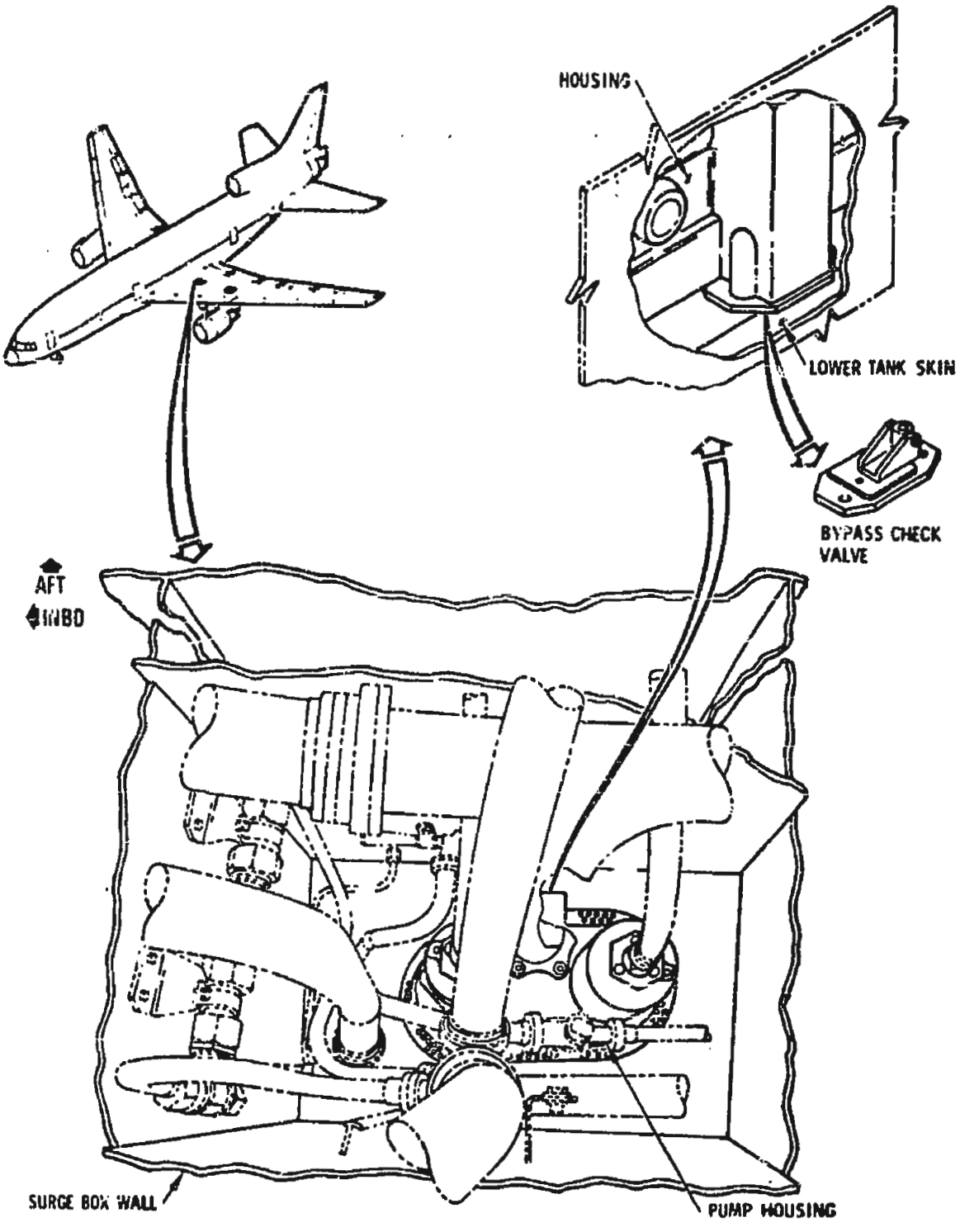


MI-37300-28-660

R Component Locator
R Figure 102 (Sheet 1)

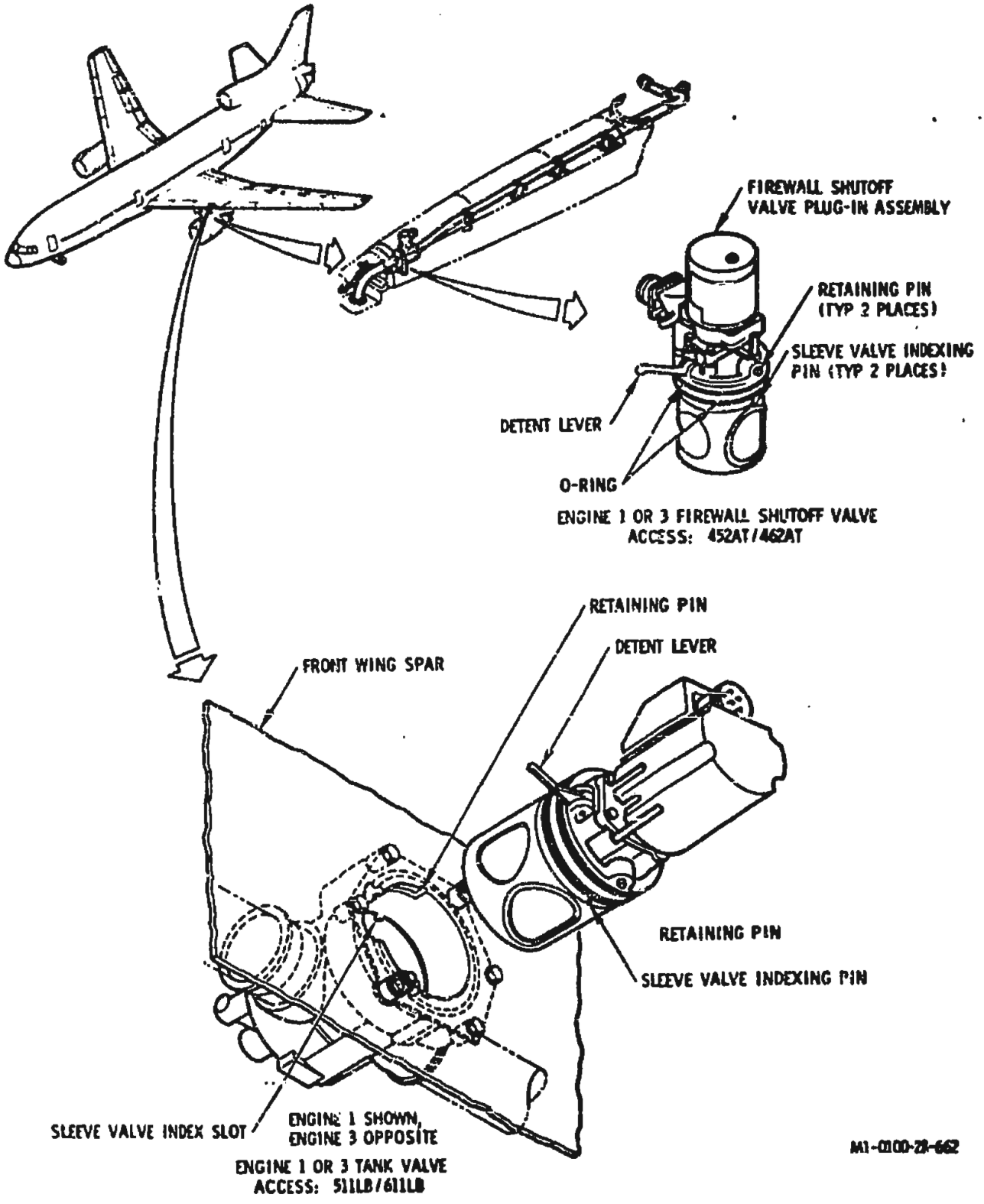


Component Locator
Figure 102 (Sheet 1)



R
R

Component Locator
Figure 102 (Sheet 2)

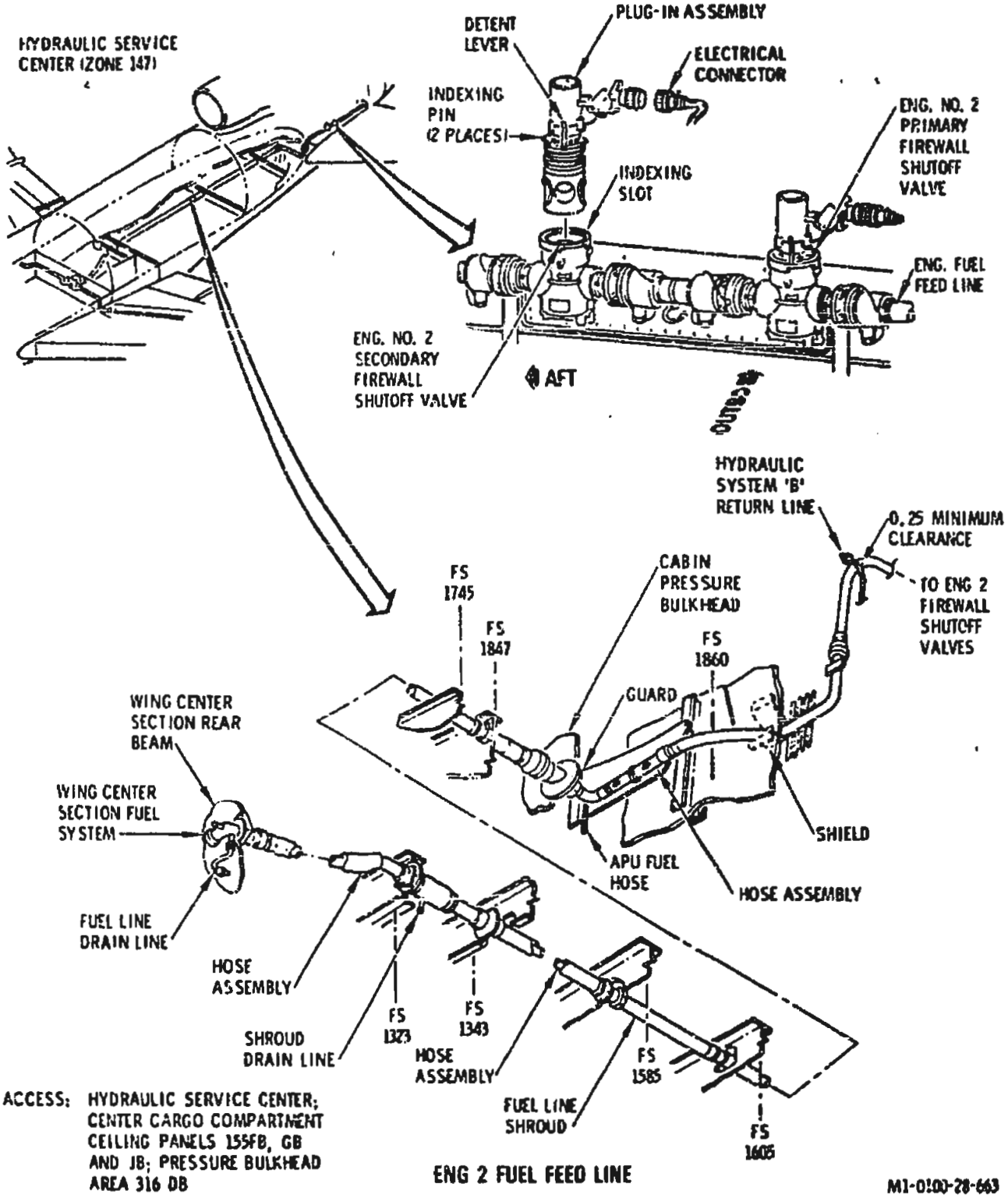

FIREWALL SHUTOFF VALVE PLUG-IN ASSEMBLY
RETAINING PIN (TYP 2 PLACES)
SLEEVE VALVE INDEXING PIN (TYP 2 PLACES)
DETENT LEVER
O-RING
ENGINE 1 OR 3 FIREWALL SHUTOFF VALVE ACCESS: 452AT/462AT
RETAINING PIN
DETENT LEVER
FRONT WING SPAR
RETAINING PIN
SLEEVE VALVE INDEXING PIN
SLEEVE VALVE INDEX SLOT
ENGINE 1 SHOWN, ENGINE 3 OPPOSITE
ENGINE 1 OR 3 TANK VALVE ACCESS: 511LB/611LB
M1-0100-28-662

R
R

Component Locator
Figure 102 (Sheet 3)

EFFECTIVITY: ALL

0018



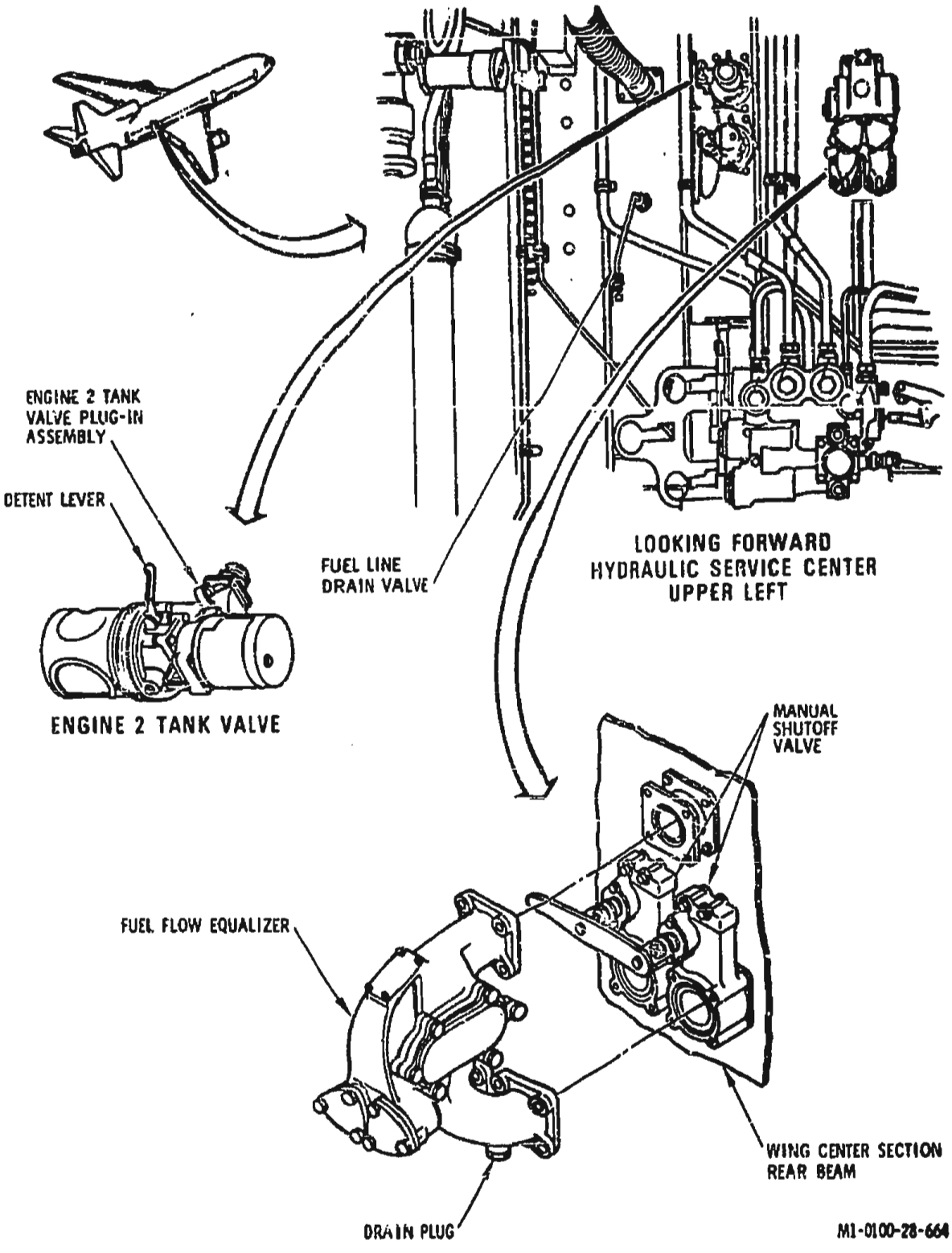
ACCESS: HYDRAULIC SERVICE CENTER; CENTER CARGO COMPARTMENT CEILING PANELS 155FB, GB AND JB; PRESSURE BULKHEAD AREA 316 DB

ENG 2 FUEL FEED LINE

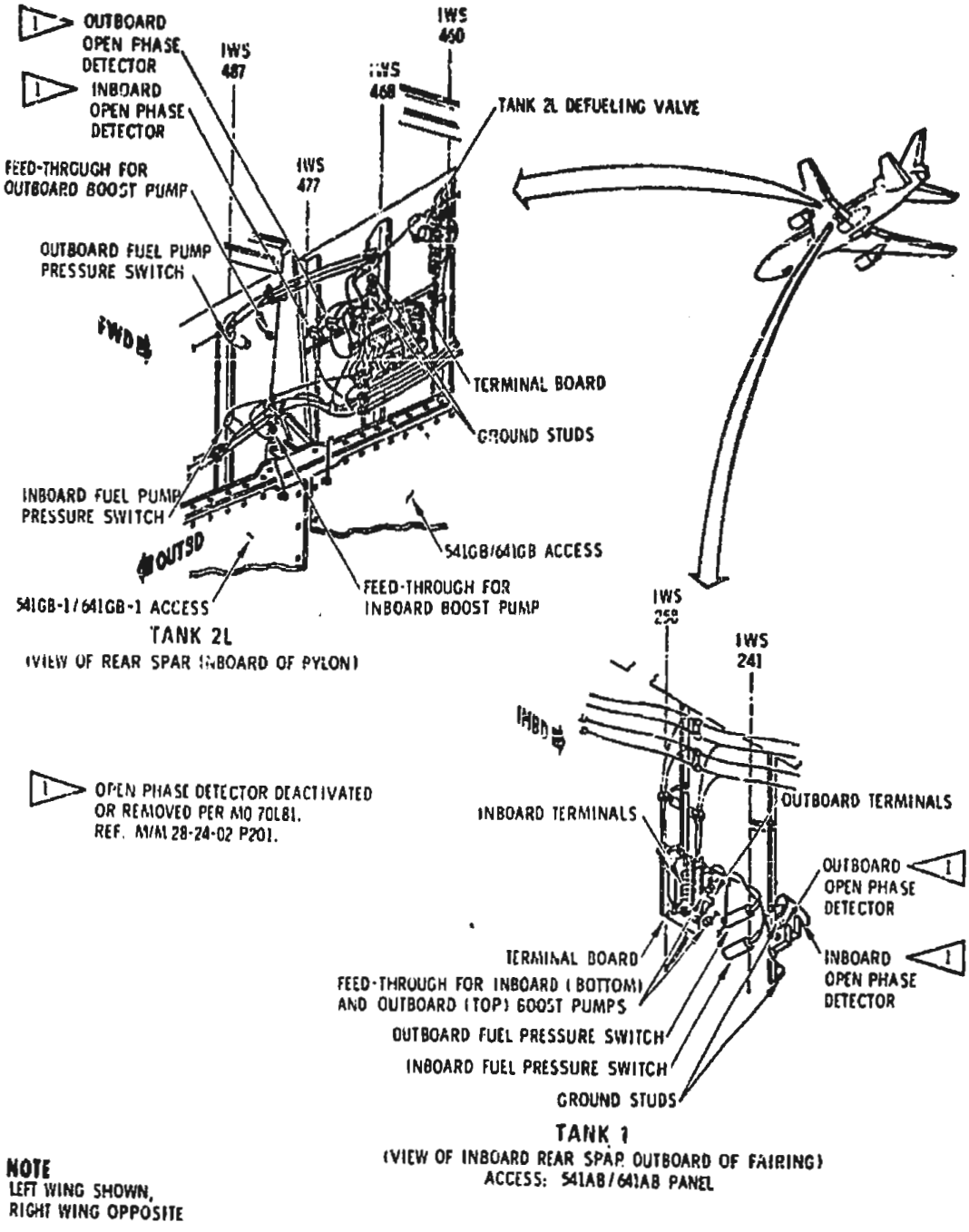
M1-0100-28-663

R
R

Component Locator
Figure 102 (Sheet 4)



R Component Locator
R Figure 102 (Sheet 5)



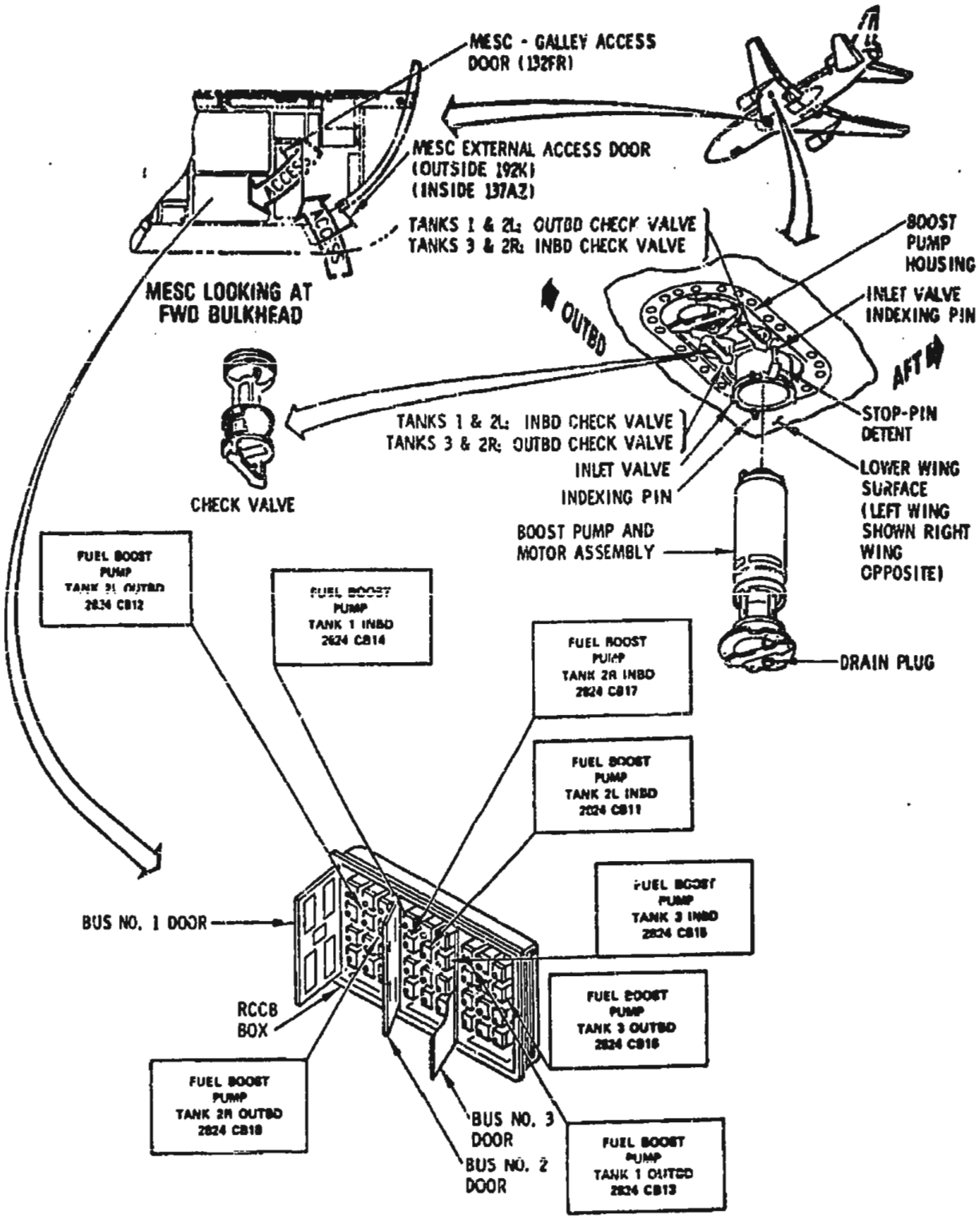
M1-0002-28-685

CR
CR

Component Locator
Figure 102 (Sheet 6)

EFFECTIVITY: ALL

001B


MESC - GALLEY ACCESS DOOR (132FR)
MESC EXTERNAL ACCESS DOOR
(OUTSIDE 192K)
(INSIDE 137AZ)
TANKS 1 & 2L: OUTBD CHECK VALVE
TANKS 3 & 2R: INBD CHECK VALVE
MESC LOOKING AT FWD BULKHEAD
BOOST PUMP HOUSING
INLET VALVE INDEXING PIN
OUTBD
AFT
TANKS 1 & 2L: INBD CHECK VALVE
TANKS 3 & 2R: OUTBD CHECK VALVE
STOP-PIN DETENT
INLET VALVE INDEXING PIN
LOWER WING SURFACE (LEFT WING SHOWN RIGHT WING OPPOSITE)
CHECK VALVE
BOOST PUMP AND MOTOR ASSEMBLY
DRAIN PLUG
FUEL BOOST PUMP TANK 2L OUTBD 2624 CB12
FUEL BOOST PUMP TANK 1 INBD 2624 CB14
FUEL BOOST PUMP TANK 2R INBD 2624 CB17
FUEL BOOST PUMP TANK 2L INBD 2624 CB11
FUEL BOOST PUMP TANK 3 INBD 2624 CB15
FUEL BOOST PUMP TANK 3 OUTBD 2624 CB16
FUEL BOOST PUMP TANK 2R OUTBD 2624 CB18
FUEL BOOST PUMP TANK 1 OUTBD 2624 CB13
BUS NO. 1 DOOR
RCCB BOX
BUS NO. 3 DOOR
BUS NO. 2 DOOR

M1-0101-28-667

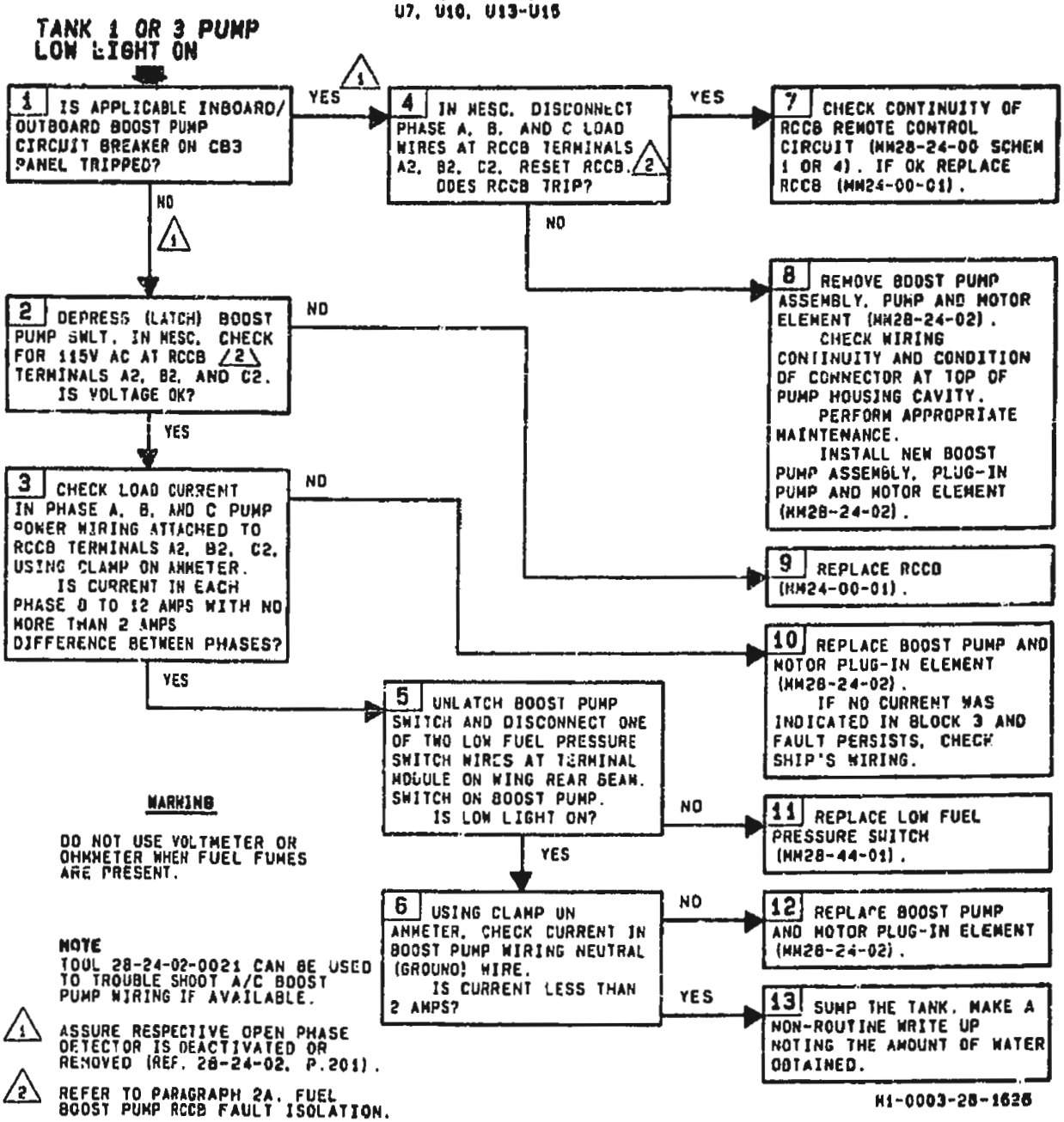
R Component Locator
R Figure 102 (Sheet 7)

R EFFECTIVITY: ALL

R

001B

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
ENGINE FUEL TANK VALVES OPEN
EMERGENCY SHUTOFF LIGHTS OUT
CROSSFEED VALVES CLOSED
PANEL LIGHTS TEST OK (MM33-17-00)
CB'S: C83 (U1 OR U2)
U7, U10, U13-U15


TANK 1 OR 3 PUMP LOW LIGHT ON
1 IS APPLICABLE INBOARD/ OUTBOARD BOOST PUMP CIRCUIT BREAKER ON CB3 PANEL TRIPPED?
YES
NO
1
4 IN NESC, DISCONNECT PHASE A, B, AND C LOAD WIRES AT RCCB TERMINALS A2, B2, C2. RESET RCCB. 2 DOES RCCB TRIP?
YES
NO
7 CHECK CONTINUITY OF RCCB REMOTE CONTROL CIRCUIT (MM28-24-00 SCHEM 1 OR 4). IF OK REPLACE RCCB (MM24-00-01).
8 REMOVE BOOST PUMP ASSEMBLY, PUMP AND MOTOR ELEMENT (MM28-24-02). CHECK WIRING CONTINUITY AND CONDITION OF CONNECTOR AT TOP OF PUMP HOUSING CAVITY. PERFORM APPROPRIATE MAINTENANCE. INSTALL NEW BOOST PUMP ASSEMBLY, PLUG-IN PUMP AND MOTOR ELEMENT (MM28-24-02).
2 DEPRESS (LATCH) BOOST PUMP SWLT. IN NESC, CHECK FOR 115V AC AT RCCB 2 TERMINALS A2, B2, AND C2. IS VOLTAGE OK?
NO
YES
9 REPLACE RCCB (MM24-00-01).
3 CHECK LOAD CURRENT IN PHASE A, B, AND C PUMP POWER WIRING ATTACHED TO RCCB TERMINALS A2, B2, C2, USING CLAMP ON ANMETER. IS CURRENT IN EACH PHASE 0 TO 12 AMPS WITH NO MORE THAN 2 AMPS DIFFERENCE BETWEEN PHASES?
NO
YES
10 REPLACE BOOST PUMP AND MOTOR PLUG-IN ELEMENT (MM28-24-02). IF NO CURRENT WAS INDICATED IN BLOCK 3 AND FAULT PERSISTS, CHECK SHIP'S WIRING.
5 UNLATCH BOOST PUMP SWITCH AND DISCONNECT ONE OF TWO LOW FUEL PRESSURE SWITCH WIRES AT TERMINAL MODULE ON WING REAR BEAM. SWITCH ON BOOST PUMP. IS LOW LIGHT ON?
NO
YES
11 REPLACE LOW FUEL PRESSURE SWITCH (MM28-44-01).
6 USING CLAMP ON ANMETER, CHECK CURRENT IN BOOST PUMP WIRING NEUTRAL (GROUND) WIRE. IS CURRENT LESS THAN 2 AMPS?
NO
YES
12 REPLACE BOOST PUMP AND MOTOR PLUG-IN ELEMENT (MM28-24-02).
13 SUMP THE TANK. MAKE A NON-ROUTINE WRITE UP NOTING THE AMOUNT OF WATER OBTAINED.
MARKING
DO NOT USE VOLTMETER OR OHMMETER WHEN FUEL FUMES ARE PRESENT.
NOTE
TOOL 28-24-02-0021 CAN BE USED TO TROUBLE SHOOT A/C BOOST PUMP WIRING IF AVAILABLE.
1 ASSURE RESPECTIVE OPEN PHASE DETECTOR IS DEACTIVATED OR REMOVED (REF. 28-24-02, P.201).
2 REFER TO PARAGRAPH 2A, FUEL BOOST PUMP RCCB FAULT ISOLATION.
M1-0003-28-1626

CR Tank 1 or 3 Pump Low Light On
CR Figure 103

EFFECTIVITY: ALL

001B

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
ENGINE FUEL TANK VALVES OPEN
EMERGENCY SHUTOFF LIGHTS OUT
CROSSFEED VALVES CLOSED
PANEL LIGHTS TEST OK (MM33-17-00)
CB'S: CB3 U1 OR U2
(U3-U4) OR (U5-U6) U8, U9

TANK 2L OR 2R PUMP LOW LIGHT ON

1 IS APPLICABLE INBOARD/OUTBOARD BOOST PUMP CIRCUIT BREAKER ON CB3 PANEL TRIPPED?
- YES (1) → 4
- NO (1) → 2

4 IN MESC, DISCONNECT PHASE A, B, AND C LOAD WIRES AT RCCB TERMINALS A2, B2, C2. RESET RCCB. (2) DOES RCCB TRIP?
- YES → 7
- NO → 8

7 CHECK CONTINUITY OF RCCB REMOTE CONTROL CIRCUIT (MM28-24-00 SCHEM 2 OR 3). IF OK REPLACE RCCB (MM24-00-01).

8 REMOVE BOOST PUMP ASSEMBLY, PUMP AND MOTOR ELEMENT (MM28-24-02).
CHECK WIRING CONTINUITY AND CONDITION OF CONNECTOR AT TOP OF PUMP HOUSING CAVITY.
PERFORM APPROPRIATE MAINTENANCE.
INSTALL NEW BOOST PUMP ASSEMBLY, PLUG-IN PUMP AND MOTOR ELEMENT (MM28-24-02).

2 DEPRESS (LATCH) BOOST PUMP SWLT. IN MESC. CHECK FOR 115V AC AT RCCB (2) TERMINALS A2, B2, AND C2. IS VOLTAGE OK?
- NO → 9
- YES → 3

9 REPLACE RCCB (MM24-00-01).

3 CHECK LOAD CURRENT IN PHASE A, B, AND C PUMP POWER WIRING ATTACHED TO RCCB TERMINALS A2, B2, C2, USING CLAMP ON AMMETER. IS CURRENT IN EACH PHASE 8 TO 12 AMPS WITH NO MORE THAN 2 AMPS DIFFERENCE BETWEEN PHASES?
- NO → 10
- YES → 5

10 REPLACE BOOST PUMP AND MOTOR PLUG-IN ELEMENT (MM28-24-02).
IF NO CURRENT WAS INDICATED IN BLOCK 3 AND FAULT PERSISTS, CHECK FOR OPEN SHIP'S WIRING.

5 UNLATCH BOOST PUMP SWITCH AND DISCONNECT ONE OF TWO LOW FUEL PRESSURE SWITCH WIRES AT TERMINAL MODULE ON WING REAR SPAR. SWITCH ON BOOST PUMP. IS LOW LIGHT ON?
- NO → 11
- YES → 6

11 REPLACE LOW FUEL PRESSURE SWITCH (MM28-34-01).

6 USING CLAMP ON AMMETER, CHECK CURRENT IN BOOST PUMP WIRING NEUTRAL (GROUND) WIRE. IS CURRENT LESS THAN 2 AMPS?
- NO → 12
- YES → 13

12 REPLACE BOOST PUMP AND MOTOR PLUG-IN ELEMENT (MM28-24-02).

13 SUMP THE TANK. MAKE A NON-ROUTINE WRITE UP NOTING THE AMOUNT OF WATER OBTAINED.

WARNING

DO NOT USE VOLTMETER OR OHMMETER WHEN FUEL FUMES ARE PRESENT.

NOTE
TOOL 28-24-02-0021 CAN BE USED TO TROUBLE SHOOT A/C BOOST PUMP WIRING IF AVAILABLE.

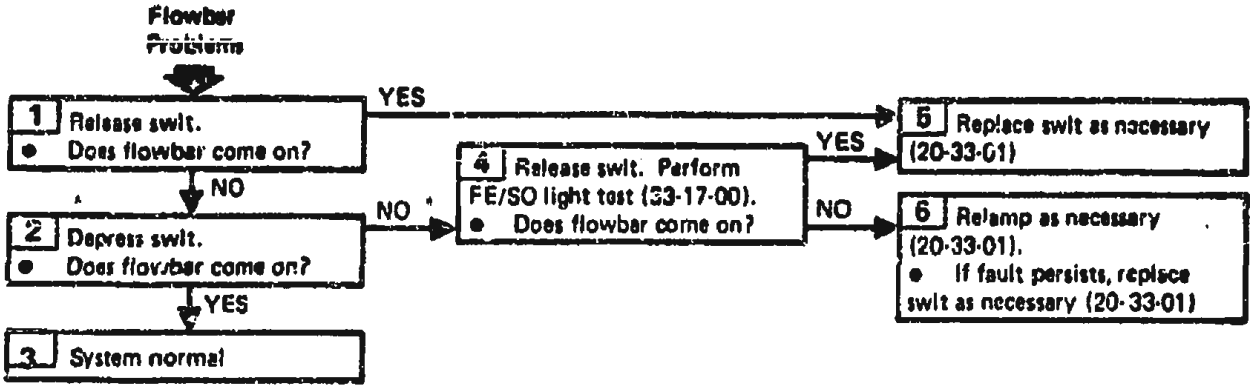
(1) ASSURE RESPECTIVE OPEN PHASE DETECTOR IS DEACTIVATED OR REMOVED (REF. 28-24-02, P.201).

(2) REFER TO PARAGRAPH 2A. FUEL BOOST PUMP RCCB FAULT ISOLATION.

M1-0003-28-1627

CR
CR

Tank 2L or 2R Pump Low Light On
Figure 104

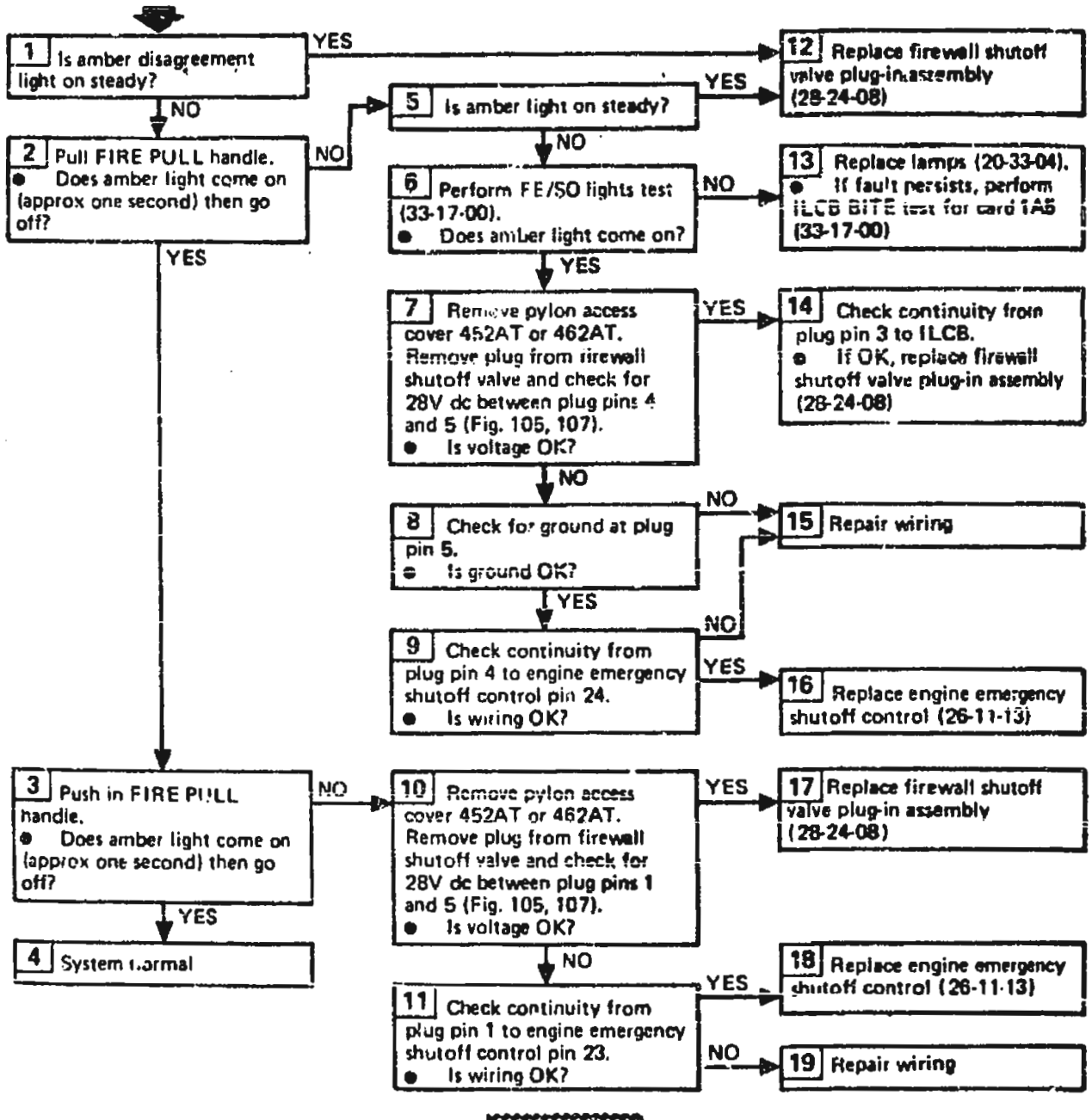


PREREQUISITES
Elec Pwr (24-00-00)
CB's: CB2-H5, J4

M1-0101-28-524

R TANK PUMPS Flowbar Problems
R Figure 105

R EFFECTIVITY: ALL
R
001B

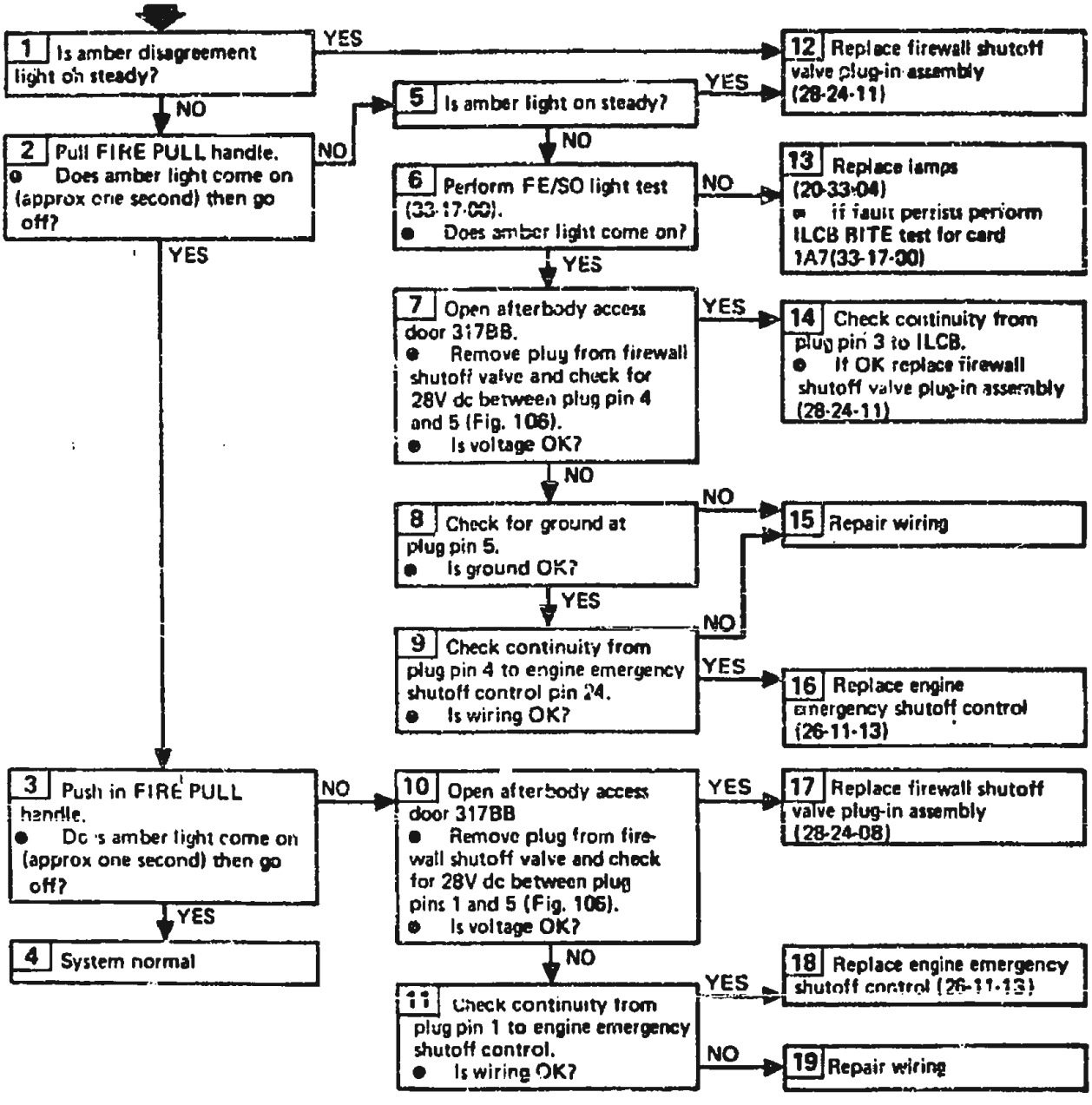

ENG 1 or 3 EMERGENCY SHUTOFF Amber Disagreement Light Checkout
1 Is amber disagreement light on steady?
YES
NO
12 Replace firewall shutoff valve plug-in assembly (28-24-08)
2 Pull FIRE PULL handle.
● Does amber light come on (approx one second) then go off?
NO
5 Is amber light on steady?
YES
NO
YES
6 Perform FE/SO lights test (33-17-00).
● Does amber light come on?
NO
13 Replace lamps (20-33-04).
● If fault persists, perform ILCB BITE test for card 1A5 (33-17-00)
YES
7 Remove pylon access cover 452AT or 462AT. Remove plug from firewall shutoff valve and check for 28V dc between plug pins 4 and 5 (Fig. 105, 107).
● Is voltage OK?
YES
14 Check continuity from plug pin 3 to ILCB.
● If OK, replace firewall shutoff valve plug-in assembly (28-24-08)
NO
8 Check for ground at plug pin 5.
● Is ground OK?
NO
15 Repair wiring
YES
9 Check continuity from plug pin 4 to engine emergency shutoff control pin 24.
● Is wiring OK?
NO
YES
16 Replace engine emergency shutoff control (26-11-13)
3 Push in FIRE PULL handle.
● Does amber light come on (approx one second) then go off?
NO
10 Remove pylon access cover 452AT or 462AT. Remove plug from firewall shutoff valve and check for 28V dc between plug pins 1 and 5 (Fig. 105, 107).
● Is voltage OK?
YES
17 Replace firewall shutoff valve plug-in assembly (28-24-08)
YES
4 System normal
NO
11 Check continuity from plug pin 1 to engine emergency shutoff control pin 23.
● Is wiring OK?
YES
18 Replace engine emergency shutoff control (26-11-13)
NO
19 Repair wiring
CAUTION
OPEN AND TAG: CB1-C10, C11, C14, C15
PREREQUISITES
Elec Pwr (24-00-00)
CB's: CB3--T7, T13
FE/SO upper instrument panel:
FIRE PULL handle 1, 3 pushed in
M1-0103-28-499

R ENG 1 or 3 EMERGENCY SHUTOFF Amber Disagreement Light Checkout
R Figure 106

R EFFECTIVITY: ALL

0018

ENG 2 EMERGENCY
SHUTOFF Amber Disagreement
Light Checkout


1 Is amber disagreement light on steady?
YES
12 Replace firewall shutoff valve plug-in assembly (28-24-11)
NO
2 Pull FIRE PULL handle.
● Does amber light come on (approx one second) then go off?
NO
5 Is amber light on steady?
YES
NO
6 Perform FE/SO light test (33-17-00).
● Does amber light come on?
NO
13 Replace lamps (20-33-04)
■ If fault persists perform ILCB BITE test for card 1A7(33-17-00)
YES
YES
7 Open afterbody access door 317BB.
● Remove plug from firewall shutoff valve and check for 28V dc between plug pin 4 and 5 (Fig. 106).
● Is voltage OK?
YES
14 Check continuity from plug pin 3 to ILCB.
● If OK replace firewall shutoff valve plug-in assembly (28-24-11)
NO
NO
8 Check for ground at plug pin 5.
● Is ground OK?
15 Repair wiring
YES
NO
9 Check continuity from plug pin 4 to engine emergency shutoff control pin 24.
● Is wiring OK?
YES
16 Replace engine emergency shutoff control (26-11-13)
3 Push in FIRE PULL handle.
● Does amber light come on (approx one second) then go off?
NO
10 Open afterbody access door 317BB
● Remove plug from firewall shutoff valve and check for 28V dc between plug pins 1 and 5 (Fig. 106).
● Is voltage OK?
YES
17 Replace firewall shutoff valve plug-in assembly (28-24-08)
YES
4 System normal
NO
YES
11 Check continuity from plug pin 1 to engine emergency shutoff control.
● Is wiring OK?
18 Replace engine emergency shutoff control (26-11-13)
NO
19 Repair wiring

PREREQUISITES
Elec Pwr (24-00-00)
CB's: CB1-D14, CB3-T10

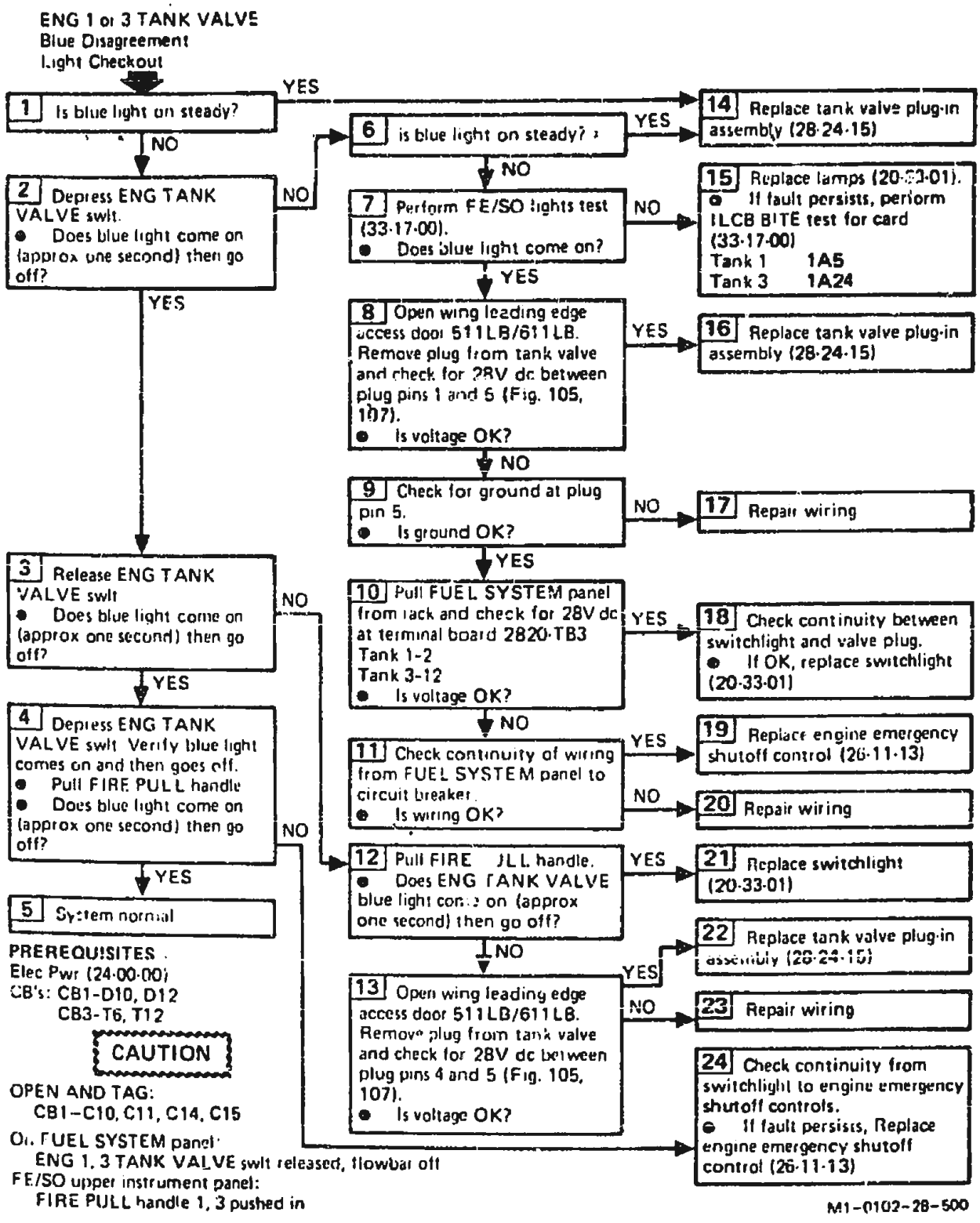
FE/SO upper instrument panel:
FIRE PULL handle 1, 3 pushed in

CAUTION

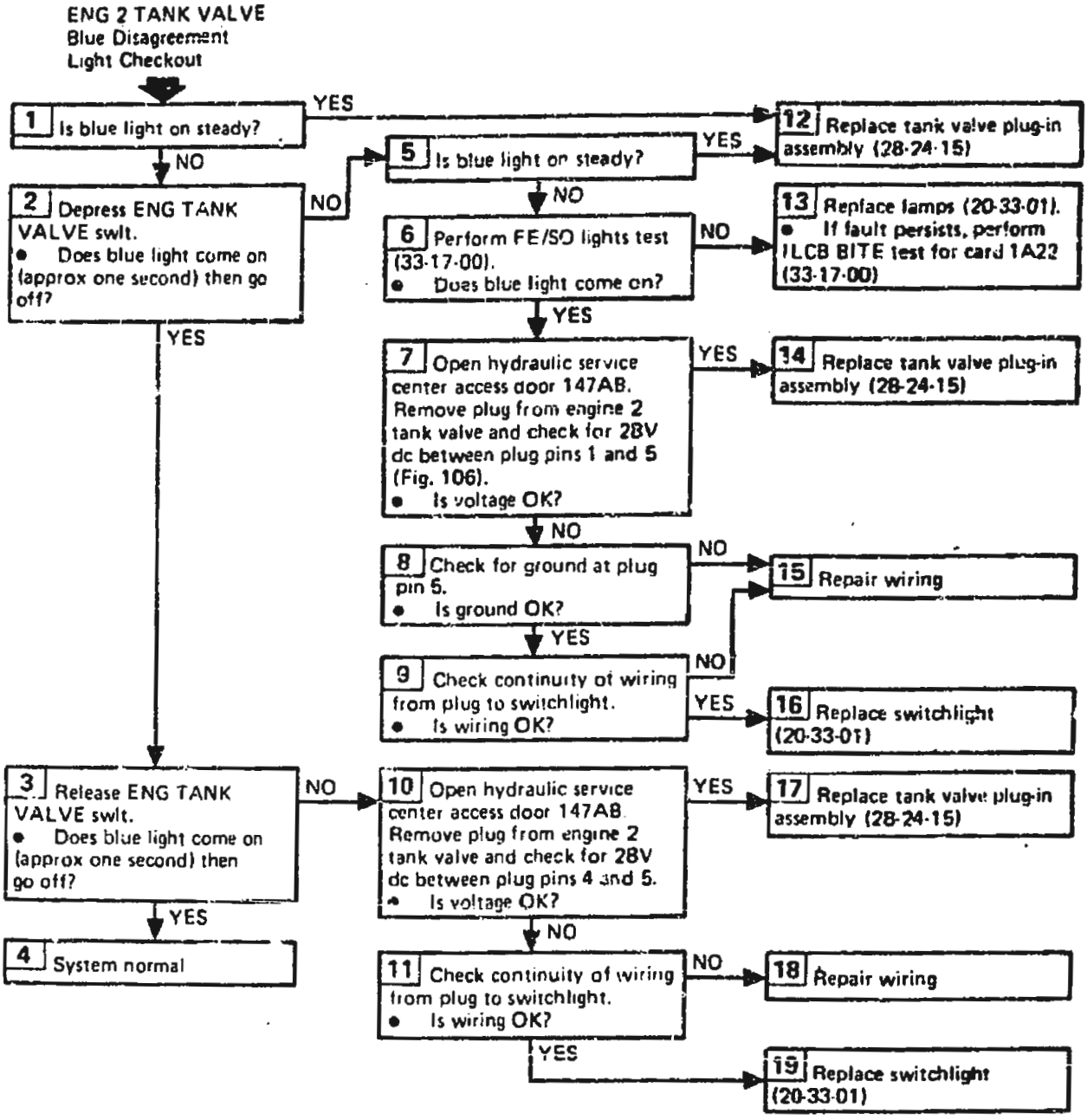
OPEN AND TAG: CB1-C12, C13

M1-0103-28-B07

ENG 2 EMERGENCY SHUTOFF Amber Disagreement Light Checkout
Figure 107


ENG 1 or 3 TANK VALVE
Blue Disagreement
Light Checkout
1 Is blue light on steady?
YES
14 Replace tank valve plug-in assembly (28-24-15)
NO
2 Depress ENG TANK VALVE swit.
• Does blue light come on (approx one second) then go off?
NO
6 Is blue light on steady?
YES
14 Replace tank valve plug-in assembly (28-24-15)
NO
7 Perform FE/SO lights test (33-17-00).
• Does blue light come on?
NO
15 Replace lamps (20-33-01).
• If fault persists, perform ILCB BITE test for card (33-17-00)
Tank 1 1A5
Tank 3 1A24
YES
8 Open wing leading edge access door 511LB/611LB. Remove plug from tank valve and check for 28V dc between plug pins 1 and 5 (Fig. 105, 107).
• Is voltage OK?
YES
16 Replace tank valve plug-in assembly (28-24-15)
NO
9 Check for ground at plug pin 5.
• Is ground OK?
NO
17 Repair wiring
YES
3 Release ENG TANK VALVE swit
• Does blue light come on (approx one second) then go off?
NO
10 Pull FUEL SYSTEM panel from rack and check for 28V dc at terminal board 2820-TB3
Tank 1-2
Tank 3-12
• Is voltage OK?
YES
18 Check continuity between switchlight and valve plug.
• If OK, replace switchlight (20-33-01)
YES
4 Depress ENG TANK VALVE swit. Verify blue light comes on and then goes off.
• Pull FIRE PULL handle
• Does blue light come on (approx one second) then go off?
NO
11 Check continuity of wiring from FUEL SYSTEM panel to circuit breaker.
• Is wiring OK?
YES
19 Replace engine emergency shutoff control (26-11-13)
NO
20 Repair wiring
YES
5 System normal
NO
12 Pull FIRE PULL handle.
• Does ENG TANK VALVE blue light come on (approx one second) then go off?
YES
21 Replace switchlight (20-33-01)
NO
13 Open wing leading edge access door 511LB/611LB. Remove plug from tank valve and check for 28V dc between plug pins 4 and 5 (Fig. 105, 107).
• Is voltage OK?
YES
22 Replace tank valve plug-in assembly (28-24-15)
NO
23 Repair wiring
24 Check continuity from switchlight to engine emergency shutoff controls.
• If fault persists, Replace engine emergency shutoff control (26-11-13)
PREREQUISITES
Elec Pwr (24-00-00)
CB's: CB1-D10, D12
CB3-T6, T12
CAUTION
OPEN AND TAG:
CB1-C10, C11, C14, C15
On FUEL SYSTEM panel:
ENG 1, 3 TANK VALVE swit released, flowbar off
FE/SO upper instrument panel:
FIRE PULL handle 1, 3 pushed in
M1-0102-28-500

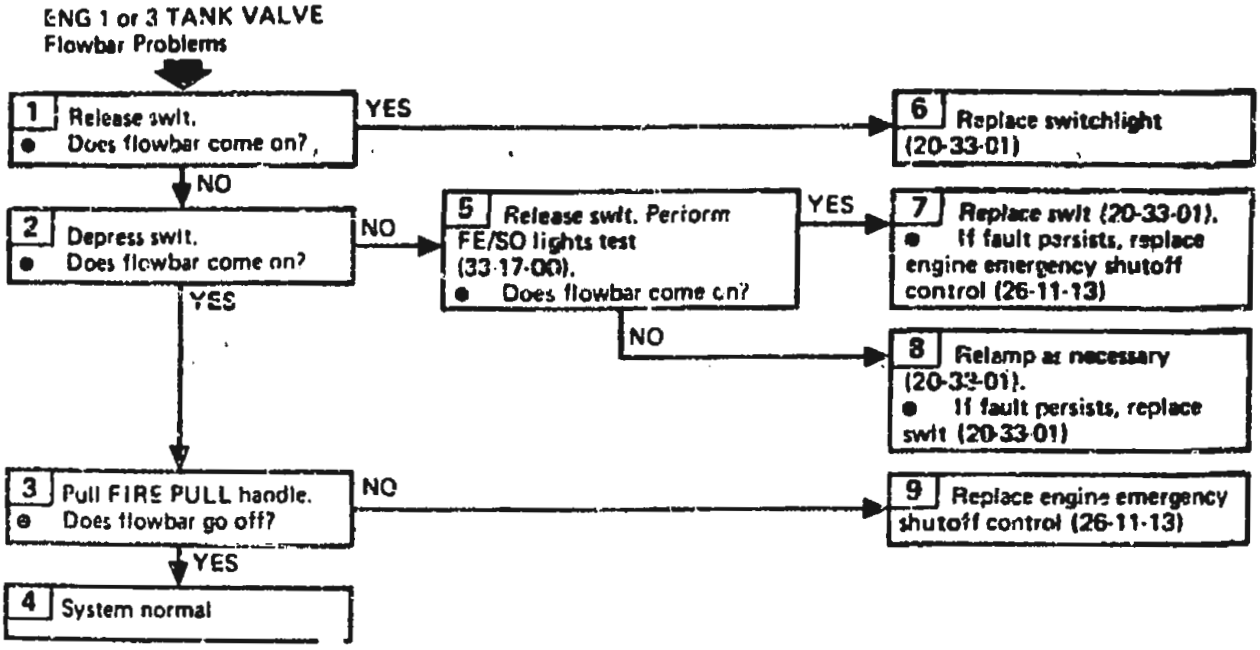
ENG 1 or 3 TANK VALVE Blue Disagreement Light Checkout
Figure 108


ENG 2 TANK VALVE
Blue Disagreement
Light Checkout
1 Is blue light on steady?
YES
12 Replace tank valve plug-in assembly (28-24-15)
NO
2 Depress ENG TANK VALVE swlt.
• Does blue light come on (approx one second) then go off?
NO
5 Is blue light on steady?
YES
NO
6 Perform FE/SO lights test (33-17-00).
• Does blue light come on?
NO
13 Replace lamps (20-33-01).
• If fault persists, perform ILCB BITE test for card 1A22 (33-17-00)
YES
7 Open hydraulic service center access door 147AB. Remove plug from engine 2 tank valve and check for 28V dc between plug pins 1 and 5 (Fig. 106).
• Is voltage OK?
YES
14 Replace tank valve plug-in assembly (28-24-15)
NO
8 Check for ground at plug pin 5.
• Is ground OK?
NO
15 Repair wiring
YES
9 Check continuity of wiring from plug to switchlight.
• Is wiring OK?
NO
YES
16 Replace switchlight (20-33-01)
3 Release ENG TANK VALVE swlt.
• Does blue light come on (approx one second) then go off?
NO
10 Open hydraulic service center access door 147AB. Remove plug from engine 2 tank valve and check for 28V dc between plug pins 4 and 5.
• Is voltage OK?
YES
17 Replace tank valve plug-in assembly (28-24-15)
YES
4 System normal
NO
11 Check continuity of wiring from plug to switchlight.
• Is wiring OK?
NO
18 Repair wiring
YES
19 Replace switchlight (20-33-01)

PREREQUISITES
Elec Pwr (24 00-00)
CB's: CB1-D11, CB3-T9
On FUEL SYSTEM panel: ENG 2 TANK VALVE swlt released, Flowbar off

M1-0102-28-502

ENG 2 TANK VALVE Blue Disagreement Light Checkout
Figure 109



CAUTION

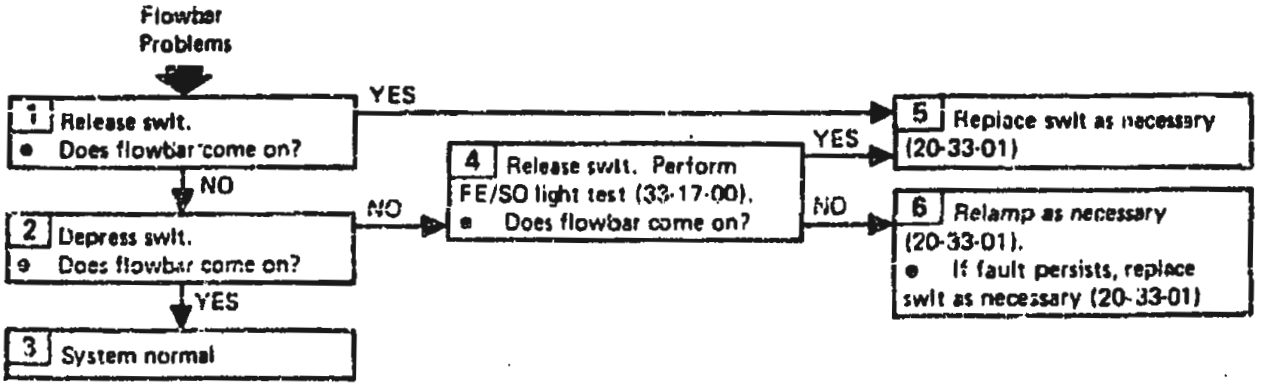
OPEN AND TAG: CB1–C10, C11, C14, C15

PREREQUISITES
Elec Pwr (24-00-00)
CB's: CB2–H5, J4

FE/SO upper instrument panel:
FIRE PULL handles 1 and 3 pushed in

M1-0101-28-503

ENG 1 or 3 TANK VALVE Flowbar Checkout
Figure 110



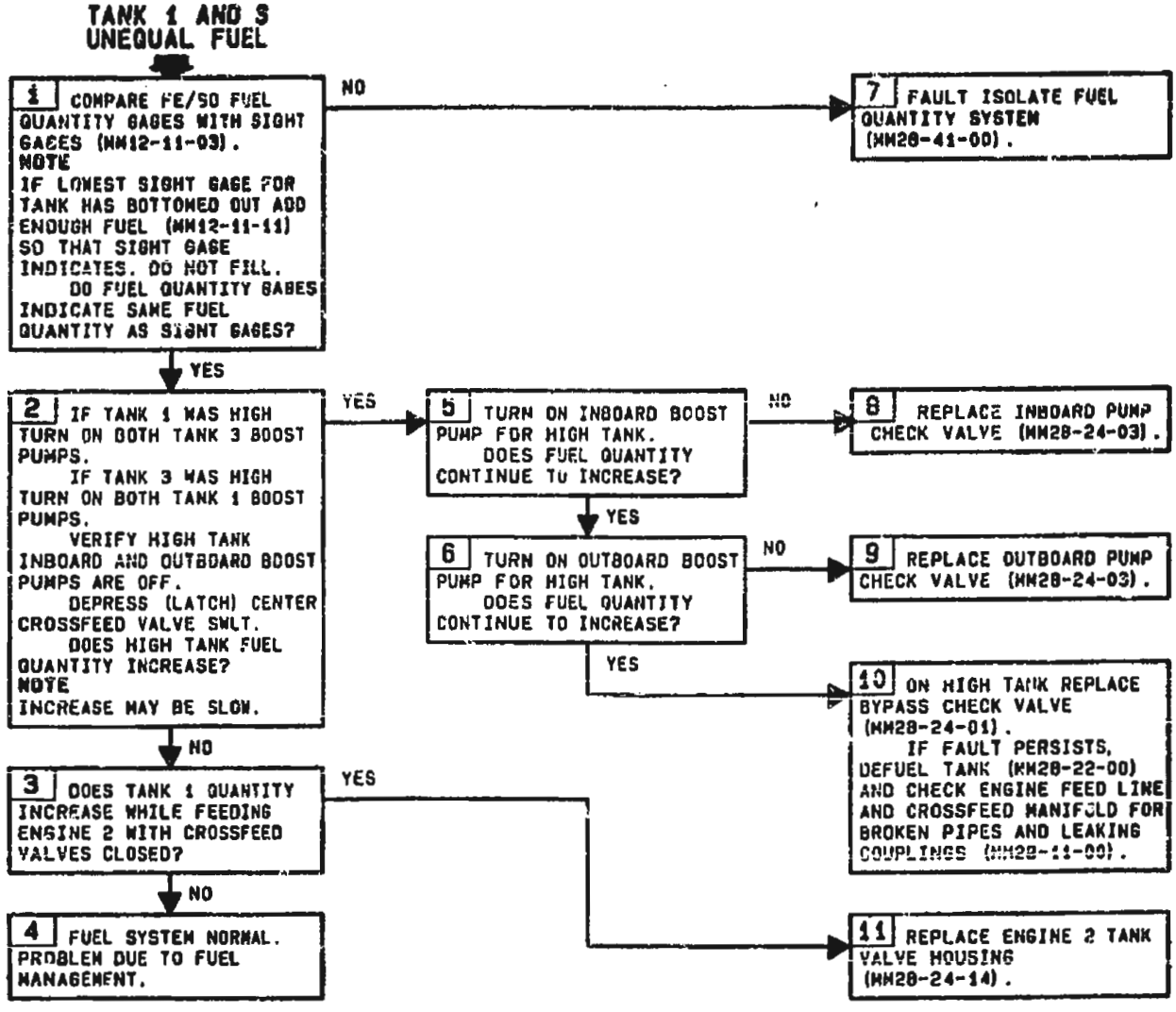
PREREQUISITES
Elec Pwr (24-00-00)
CB's: CB2-H5, J4

M1-0101-28-524

ENG 2 TANK VALVE Flowbar Checkout
Figure 111

R
R
0018 EFFECTIVITY: ALL

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: CB3-U7, U10, U13 THRU U15
U3, U4, OR U5, U6, T2, T5, T10

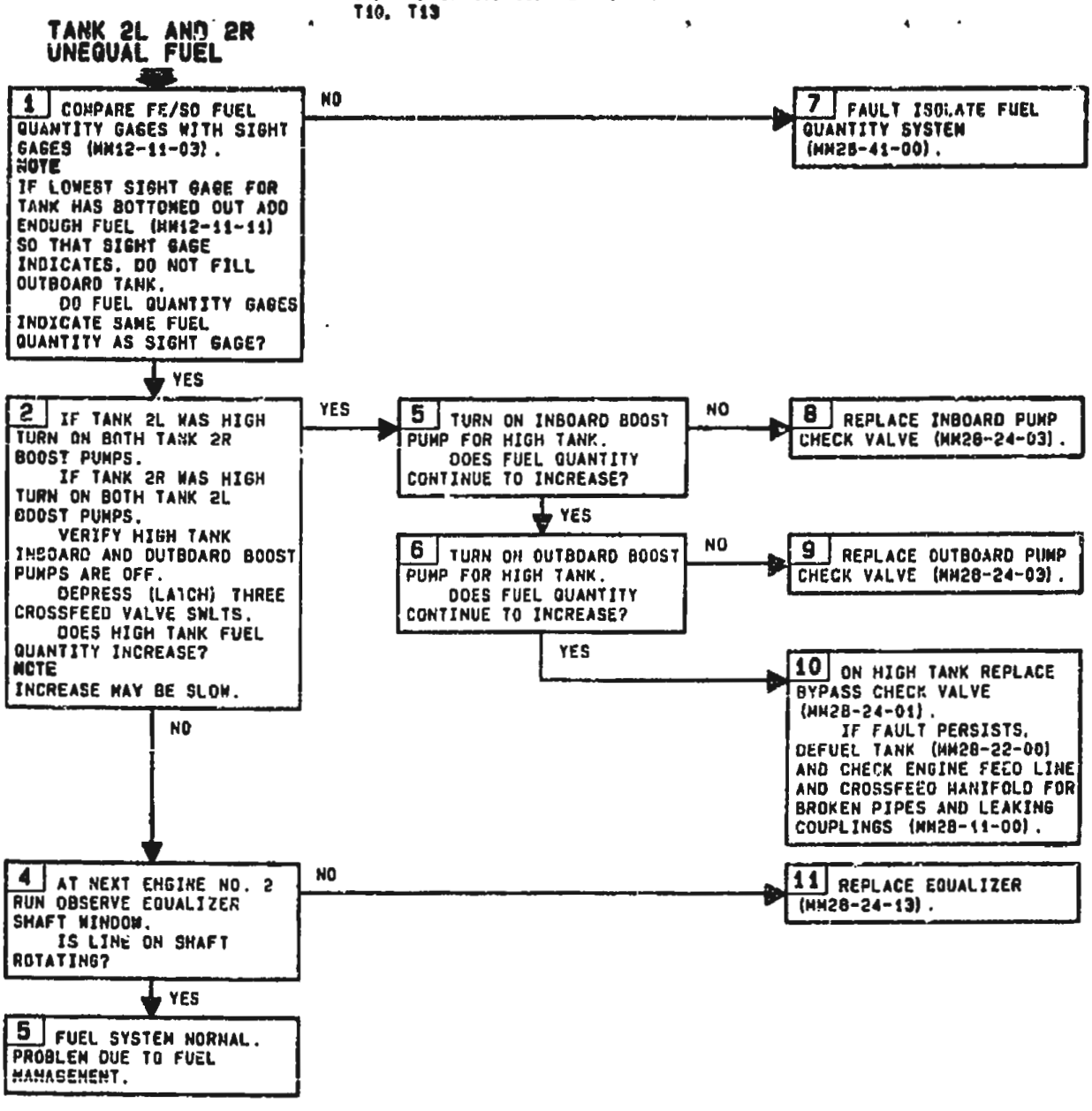

TANK 1 AND 3 UNEQUAL FUEL
1 COMPARE FE/SO FUEL QUANTITY GAGES WITH SIGHT GAGES (MM12-11-03).
NOTE
IF LOWEST SIGHT GAGE FOR TANK HAS BOTTOMED OUT ADD ENOUGH FUEL (MM12-11-11) SO THAT SIGHT GAGE INDICATES. DO NOT FILL.
DO FUEL QUANTITY GAGES INDICATE SAME FUEL QUANTITY AS SIGHT GAGES?
NO
7 FAULT ISOLATE FUEL QUANTITY SYSTEM (MM28-41-00).
YES
2 IF TANK 1 WAS HIGH TURN ON BOTH TANK 3 BOOST PUMPS.
IF TANK 3 WAS HIGH TURN ON BOTH TANK 1 BOOST PUMPS.
VERIFY HIGH TANK INBOARD AND OUTBOARD BOOST PUMPS ARE OFF.
DEPRESS (LATCH) CENTER CROSSFEED VALVE SWLT.
DOES HIGH TANK FUEL QUANTITY INCREASE?
NOTE
INCREASE MAY BE SLOW.
YES
5 TURN ON INBOARD BOOST PUMP FOR HIGH TANK.
DOES FUEL QUANTITY CONTINUE TO INCREASE?
NO
8 REPLACE INBOARD PUMP CHECK VALVE (MM28-24-03).
YES
6 TURN ON OUTBOARD BOOST PUMP FOR HIGH TANK.
DOES FUEL QUANTITY CONTINUE TO INCREASE?
NO
9 REPLACE OUTBOARD PUMP CHECK VALVE (MM28-24-03).
YES
10 ON HIGH TANK REPLACE BYPASS CHECK VALVE (MM28-24-01).
IF FAULT PERSISTS, DEFUEL TANK (MM28-22-00) AND CHECK ENGINE FEED LINE AND CROSSFEED MANIFOLD FOR BROKEN PIPES AND LEAKING COUPLINGS (MM28-11-00).
NO
3 DOES TANK 1 QUANTITY INCREASE WHILE FEEDING ENGINE 2 WITH CROSSFEED VALVES CLOSED?
YES
11 REPLACE ENGINE 2 TANK VALVE HOUSING (MM28-24-14).
NO
4 FUEL SYSTEM NORMAL. PROBLEM DUE TO FUEL MANAGEMENT.

M1-0000-28-1792

CR Tank 1 or 3 Fuel Quantity Slowly Increasing or
CR Not Decreasing Normally
CR Figure 112

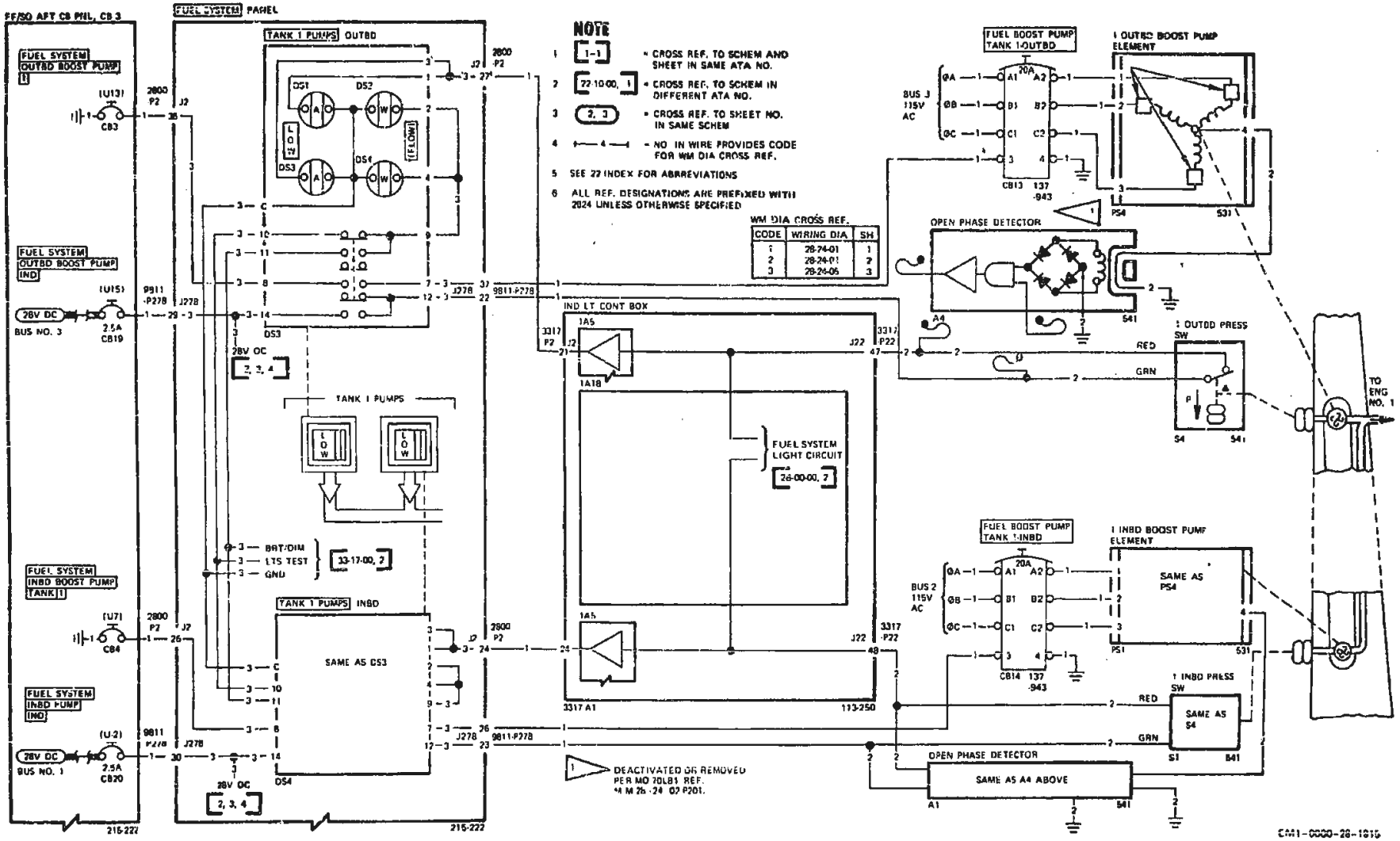
EFFECTIVITY: ALL

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: CB3-U7, U10, U13 THRU U15
U3, U4, OR U5, U6, T2-T3, T7,
T10, T13


TANK 2L AND 2R UNEQUAL FUEL
1 COMPARE FE/SO FUEL QUANTITY GAGES WITH SIGHT GAGES (MM12-11-03).
NOTE
IF LOWEST SIGHT GAGE FOR TANK HAS BOTTOMED OUT ADD ENOUGH FUEL (MM12-11-11) SO THAT SIGHT GAGE INDICATES. DO NOT FILL OUTBOARD TANK.
DO FUEL QUANTITY GAGES INDICATE SAME FUEL QUANTITY AS SIGHT GAGE?
NO
7 FAULT ISOLATE FUEL QUANTITY SYSTEM (MM28-41-00).
YES
2 IF TANK 2L WAS HIGH TURN ON BOTH TANK 2R BOOST PUMPS.
IF TANK 2R WAS HIGH TURN ON BOTH TANK 2L BOOST PUMPS.
VERIFY HIGH TANK INBOARD AND OUTBOARD BOOST PUMPS ARE OFF.
DEPRESS (LATCH) THREE CROSSFEED VALVE SWLTS.
DOES HIGH TANK FUEL QUANTITY INCREASE?
NOTE
INCREASE MAY BE SLOW.
YES
5 TURN ON INBOARD BOOST PUMP FOR HIGH TANK.
DOES FUEL QUANTITY CONTINUE TO INCREASE?
NO
8 REPLACE INBOARD PUMP CHECK VALVE (MM28-24-03).
YES
6 TURN ON OUTBOARD BOOST PUMP FOR HIGH TANK.
DOES FUEL QUANTITY CONTINUE TO INCREASE?
NO
9 REPLACE OUTBOARD PUMP CHECK VALVE (MM28-24-03).
YES
10 ON HIGH TANK REPLACE BYPASS CHECK VALVE (MM28-24-01).
IF FAULT PERSISTS, DEFUEL TANK (MM28-22-00) AND CHECK ENGINE FEED LINE AND CROSSFEED MANIFOLD FOR BROKEN PIPES AND LEAKING COUPLINGS (MM28-11-00).
NO
4 AT NEXT ENGINE NO. 2 RUN OBSERVE EQUALIZER SHAFT WINDOW.
IS LINE ON SHAFT ROTATING?
NO
11 REPLACE EQUALIZER (MM28-24-13).
YES
5 FUEL SYSTEM NORMAL. PROBLEM DUE TO FUEL MANAGEMENT.

M1-0000-28-1778

CR Tank 2L or 2R Fuel Quantity Slowly Increasing or
CR Not Decreasing Normally
CR Figure 113

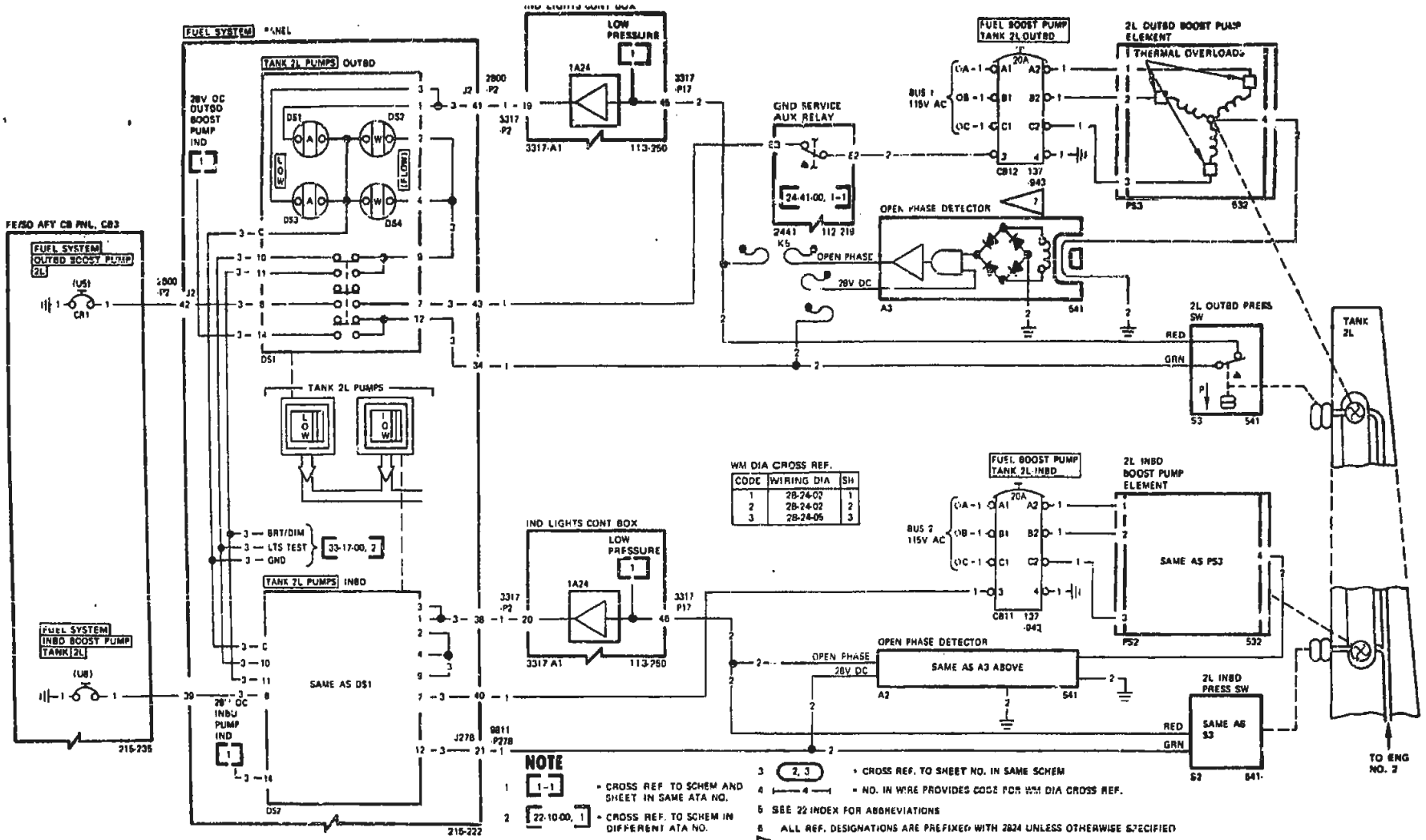


Tank 1 Boost Pumps Schematic
SCHEM 1

CR
CR

EFFECTIVITY: ALL

001B

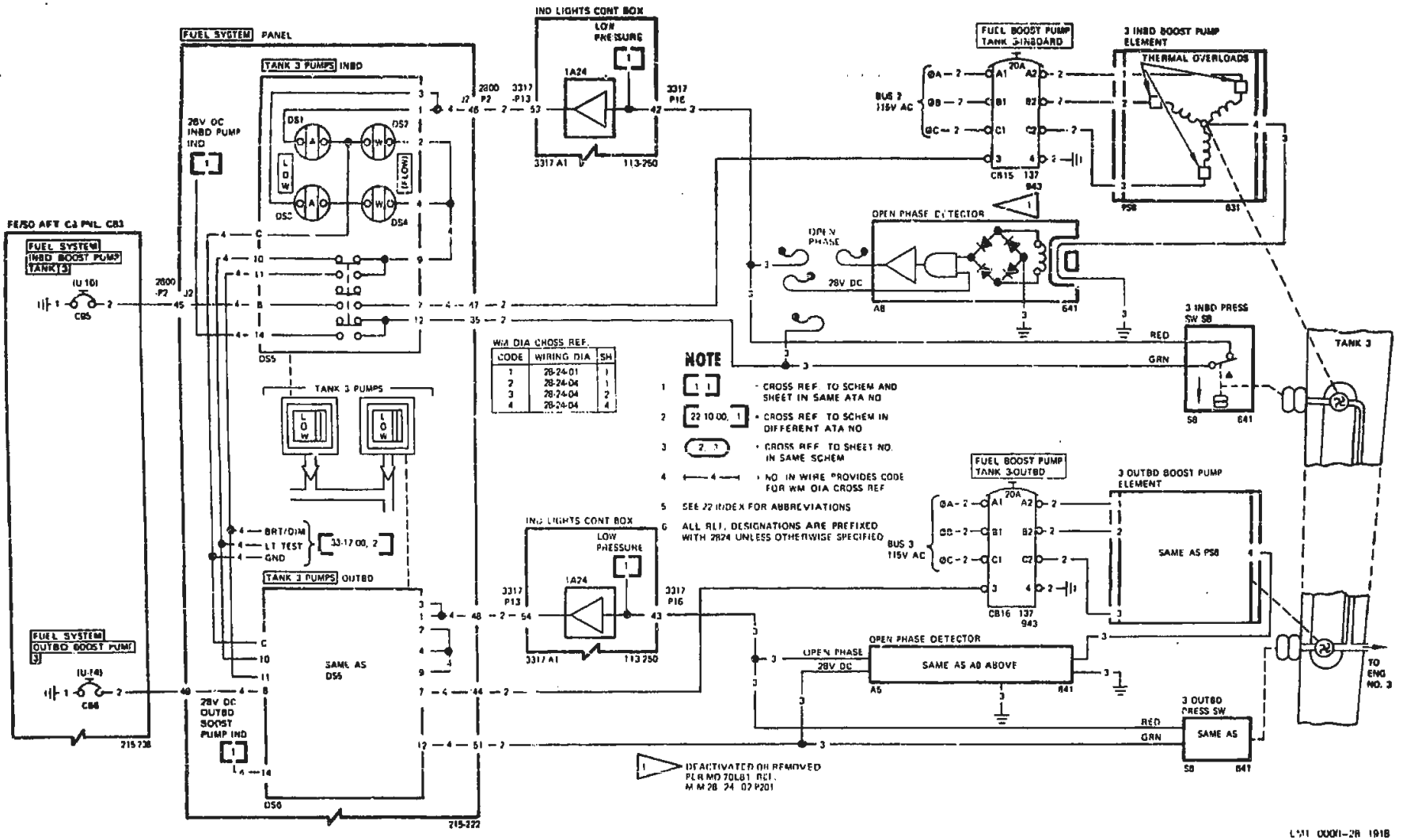


CR
CR

Tank 2L Boost Pumps Schematic
SCHEM 2

EFFECTIVITY: ALL

001B

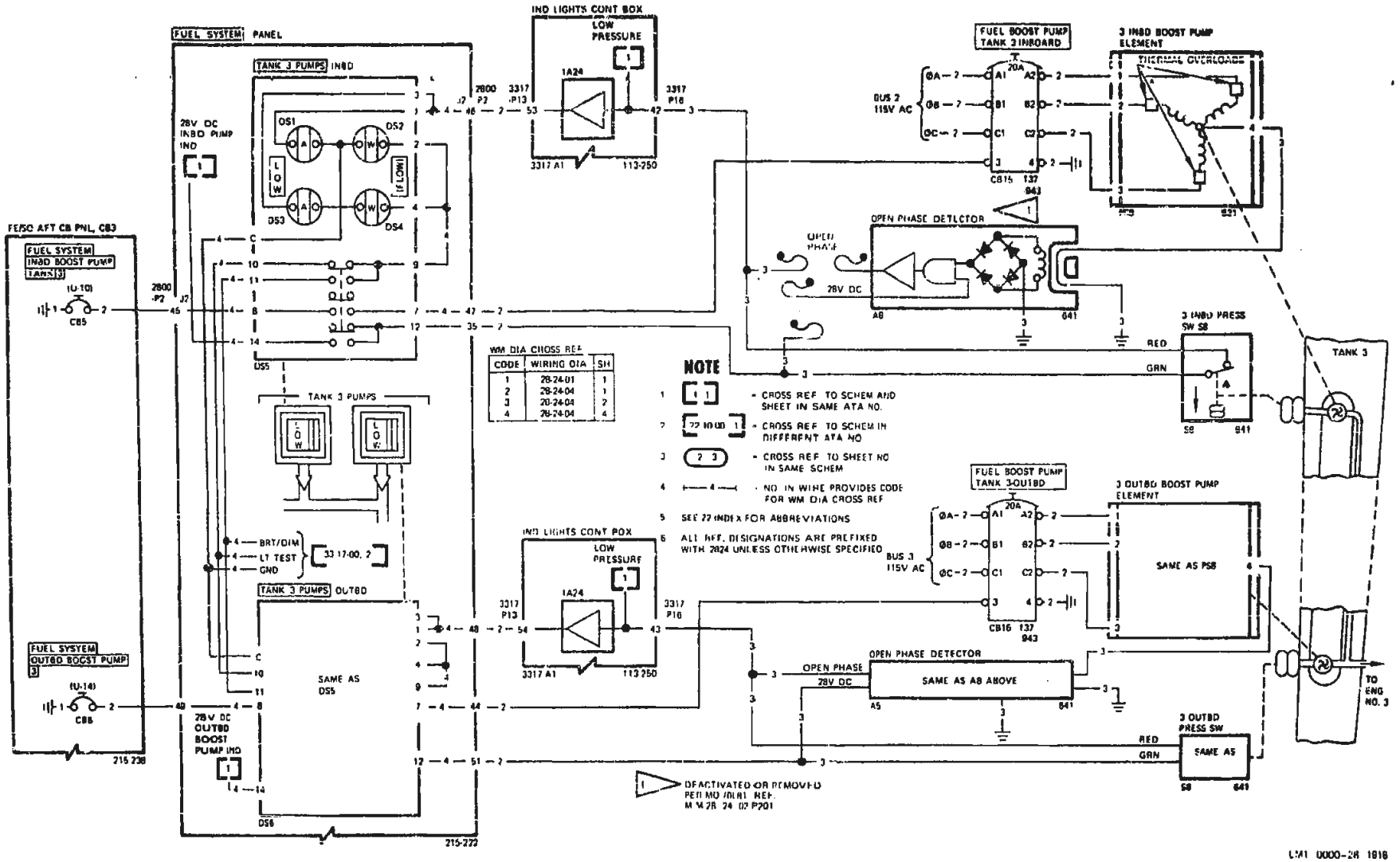

FUEL SYSTEM PANEL
TANK 3 PUMPS INBD
TANK 3 PUMPS OUTBD
TANK 3 PUMPS
IND LIGHTS CONT BOX
LOW PRESSURE
FUEL BOOST PUMP TANK 3 INBOARD
3 INBD BOOST PUMP ELEMENT
THERMAL OVERLOADS
OPEN PHASE DETECTOR
OPEN PHASE
28V DC
3 INBD PRESS SW S8
FUEL BOOST PUMP TANK 3 OUTBD
3 OUTBD BOOST PUMP ELEMENT
SAME AS P58
SAME AS A8 ABOVE
3 OUTBD PRESS SW
SAME AS S8
TANK 3
TO ENG NO. 3
BUS 3 115V AC
28V DC INBD PUMP IND
28V DC OUTBD BOOST PUMP IND
SAME AS D55
FUEL SYSTEM INBD BOOST PUMP TANK 3
FUEL SYSTEM OUTBD BOOST PUMP 3
FE/SO AFT C3 PNL C83
WM DIA CROSS REF.
CODE | WIRING DIA | SH
1 | 28-24-01 | 1
2 | 28-24-04 | 1
3 | 28-24-04 | 2
4 | 28-24-04 | 4
NOTE
1 CROSS REF TO SCHEM AND SHEET IN SAME ATA NO
2 CROSS REF TO SCHEM IN DIFFERENT ATA NO
3 CROSS REF TO SHEET NO. IN SAME SCHEM
4 NO IN WIRE PROVIDES CODE FOR WM DIA CROSS REF
5 SEE 22 INDEX FOR ABBREVIATIONS
6 ALL RLY DESIGNATIONS ARE PREFIXED WITH 2R24 UNLESS OTHERWISE SPECIFIED
DEACTIVATED OR REMOVED PER MO 70L81 REL. M M 28 24 02 P201

CR
CR

Tank 2R Boost Pumps Schematic
SCHEM 3

EFFECTIVITY: ALL

001B

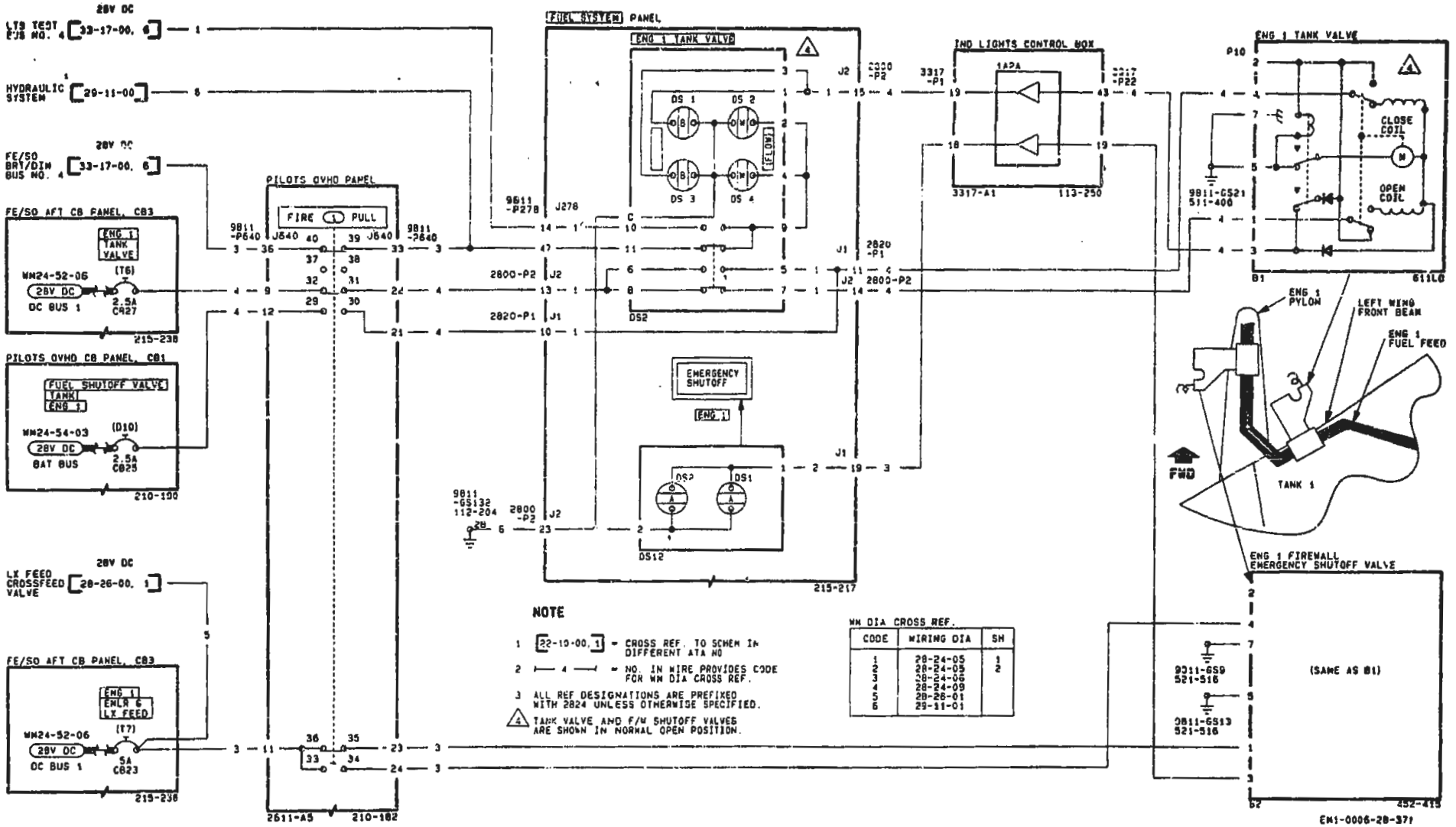

FUEL SYSTEM PANEL
TANK 3 PUMPS INBD
IND LIGHTS CONT BOX
LOW PRESSURE
1A24
FUEL BOOST PUMP TANK 3 INBOARD
3 INBD BOOST PUMP ELEMENT
THERMAL OVERLOADS
BUS 2 115V AC
28V DC INBD PUMP IND
OS1
OS2
OS3
OS4
OS5
OPEN PHASE DETECTOR
OPEN PHASE
28V DC
3 INBD PRESS SW S8
RED
GRN
TANK 3
FE/SC AFT CB PNL, CB3
FUEL SYSTEM INBD BOOST PUMP TANK 3
CB5
TANK 3 PUMPS
WM DIA CROSS REF
CODE | WIRING DIA | SH
1 | 28-24-01 | 1
2 | 28-24-04 | 1
3 | 20-24-04 | 2
4 | 28-24-04 | 4
NOTE
1 - CROSS REF TO SCHEM AND SHEET IN SAME ATA NO.
2 - CROSS REF TO SCHEM IN DIFFERENT ATA NO
3 - CROSS REF TO SHEET NO IN SAME SCHEM
4 - NO IN WIRE PROVIDES CODE FOR WM DIA CROSS REF
5 SEE 22 INDEX FOR ABBREVIATIONS
6 ALL REF. DESIGNATIONS ARE PREFIXED WITH 2824 UNLESS OTHERWISE SPECIFIED
BRT/DIM
LT TEST
GND
33 17-00, 2
TANK 3 PUMPS OUTBD
FUEL BOOST PUMP TANK 3-OUTBD
3 OUTBD BOOST PUMP ELEMENT
SAME AS PS8
BUS 3 115V AC
SAME AS DS5
SAME AS A8 ABOVE
3 OUTBD PRESS SW
SAME AS S8
FUEL SYSTEM OUTBD BOOST PUMP 3
CB6
28V DC OUTBD BOOST PUMP IND
DS6
TO ENG NO. 3
215 238
215 222
1 DEACTIVATED OR REMOVED PER MOD (NOT) REF M 24 28 00 P201

L41 0000-28 1818

CR Tank 3 Boost Pumps Schematic
CR SCHEM 4

EFFECTIVITY: ALL

001B



NOTE

1 [22-10-00, 1] = CROSS REF. TO SCHEM IN DIFFERENT ATA NO

2 — 4 — = NO. IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.

3 ALL REF DESIGNATIONS ARE PREFIXED WITH 2824 UNLESS OTHERWISE SPECIFIED.

4 TANK VALVE AND F/W SHUTOFF VALVES ARE SHOWN IN NORMAL OPEN POSITION.

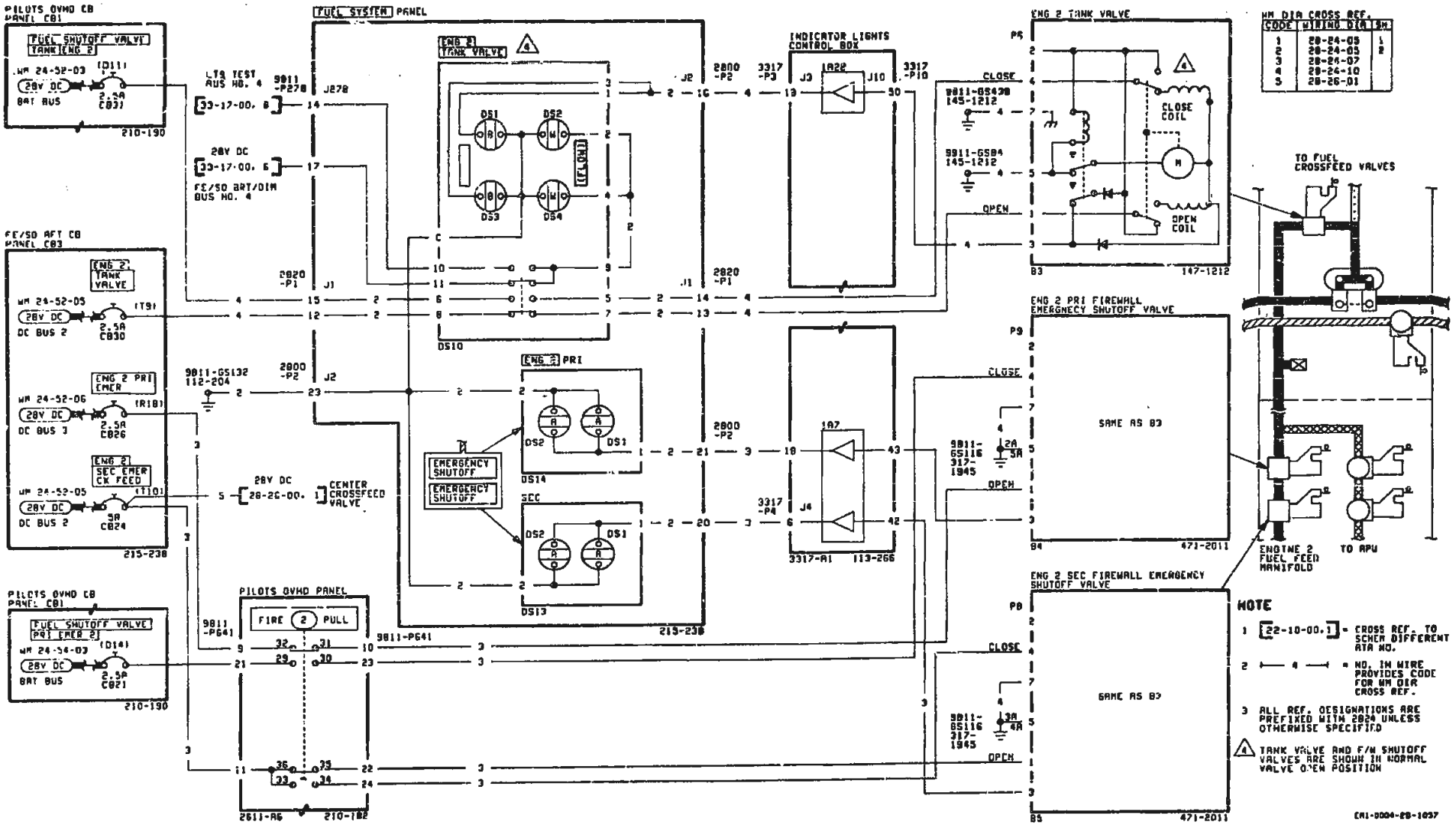
WM DIA CROSS REF.

CODE	WIRING DIA	SH
1	28-24-05	1
2	28-24-05	2
3	28-24-06	
4	28-24-09	
5	28-26-01	
6	29-11-01	

R ENG 1 Fuel Feed Schematic
R SCHEM 5

EFFECTIVITY: ALL

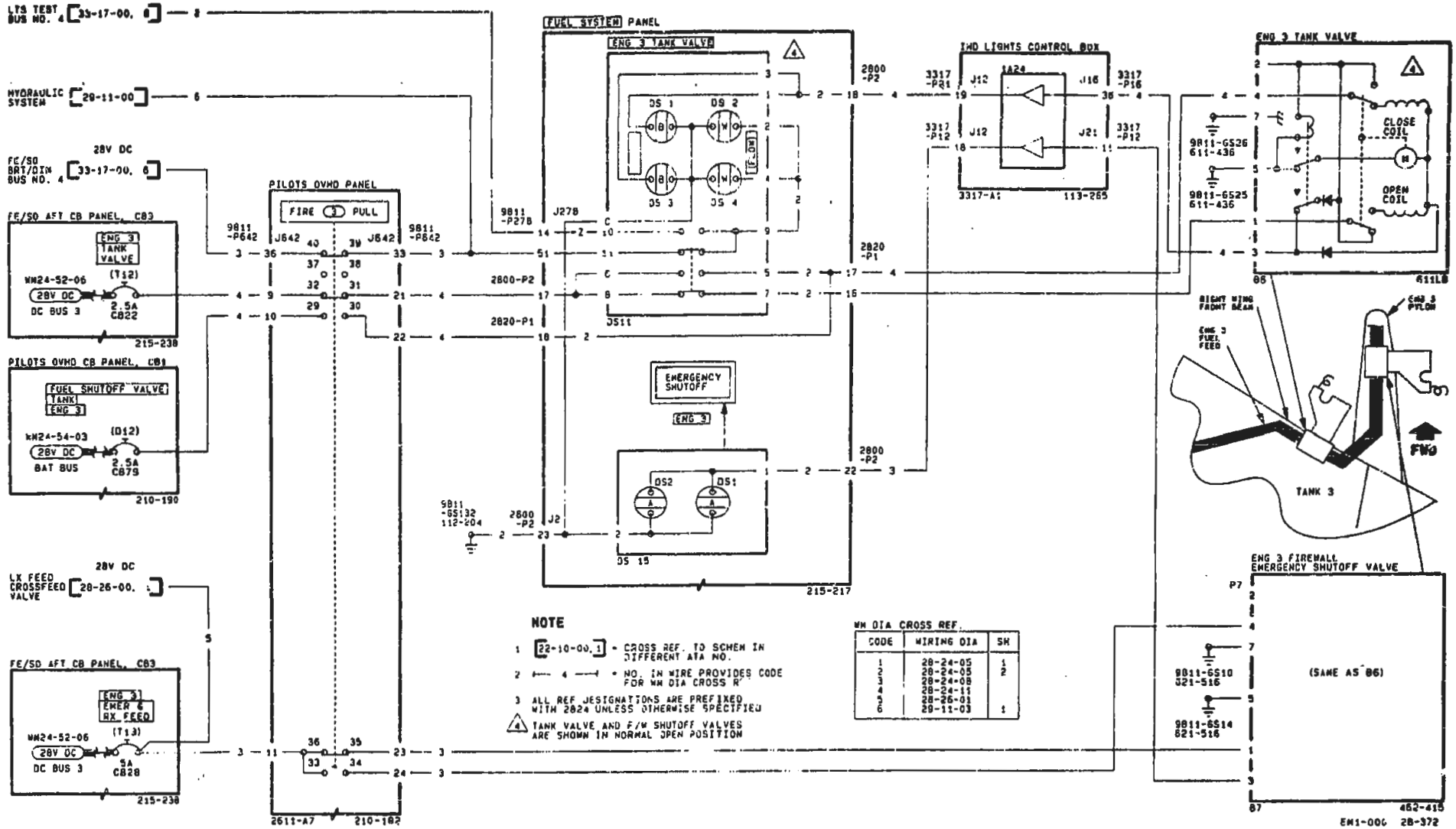
0015



R ENG 2 Fuel Feed Schematic
R SCHEM 6

EFFECTIVITY: ALL

001B



NOTE

1 [22-10-00, 1] - CROSS REF. TO SCHEM IN DIFFERENT ATA NO.

2 ⟵ 4 ⟶ - NO. IN WIRE PROVIDES CODE FOR WM DIA CROSS R

3 ALL REF DESIGNATIONS ARE PREFIXED WITH 2824 UNLESS OTHERWISE SPECIFIED

4 TANK VALVE AND F/W SHUTOFF VALVES ARE SHOWN IN NORMAL OPEN POSITION

WM DIA CROSS REF.

CODE	WIRING DIA	SH
1	28-24-05	1
2	28-24-05	2
3	28-24-08	
4	28-24-11	
5	28-26-01	
6	29-11-03	1

R ENG 3 Fuel Feed Schematic
R SCHEM 7

EFFECTIVITY: ALL

0018

ENGINE FUEL FEED SYSTEM - ADJUSTMENT AND TEST

1. General

The following adjustment and test procedures verify operation of fuel boost pumps, tank valves, crossfeed valves, and firewall shutoff valves.

These tests are performed using static fuel pressures generated by the aircraft fuel boost pumps and, therefore, do not provide a means of checking the fuel flow equalizer, which requires fuel flow to the No. 2 engine. Fuel flow equalizer operation, however, may be checked by viewing the equalizer rotor shaft through an inspection window on the side of the equalizer housing during engine No. 2 operation. Satisfactory operation is indicated when a black bar indicator on the end of the shaft
R is rotating (varying with engine speed). The static pressures
R generated by the boost pumps may or may not be enough to turn
R off an engine FUEL PRESSURE light. The FUEL PRESSURE light
R should go off after engine start.

2. Referenced Procedures

12-11-00	Servicing - Maintenance Practices
12-11-11	Underwing Pressure Fueling - Servicing
24-00-00	Electrical Power System - Maintenance Practices

3. Adjustment/Test

A. Engine Fuel Feed System Operational Test

The aircraft battery must be installed. Battery bus power is required for operation of the engine feed emergency firewall shutoff valves.

The aircraft fuel tanks must contain the following minimum amounts of fuel:

TANK NO. 1	5000 lb (2275 kg)
TANK NO. 2L	16,000 lb (7250 kg)
TANK NO. 2R	16,000 lb (7250 kg)
TANK NO. 3	5000 lb (2275 kg)

The aircraft must be statically grounded in accordance with approved procedures (Ref. 12-11-11).

(1) On pilots overhead circuit breaker panel CB1, zone 210, verify that the following FUEL SHUTOFF VALVE circuit breakers are closed:

TANK - ENG 1, 2, and 3 (D10 through D12)

PRI EMER - 2 (D14) and APU (D15)

On Flight Engineer/Second Officers overhead circuit breaker panel CB2, zone 215, verify that the following circuit breakers are closed:

IND LT - F/E PANEL - LOWER (J4)

F/E IND LT TEST 4 (H4)

On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, verify that the following FUEL SYSTEM circuit breakers are closed:

INBD PUMP IND (U1 or U2)

OUTBD BOOST PUMP - 2L and 2R (U3 and U4) or (U5 and U6)

INBD BOOST PUMP - TANK - 1, 2L, 2R, and 3 (U7 through U10)

OUTBD BOOST PUMP - 1, 3 and IND (U13 through U15)

FUEL QTY IND - TEST, 1, 2L, 2R, and 3 (T1 through T5)

ENG 1 - TANK VALVE (T6) and EMER & LX FEED (T7)

ENG 2 - TANK VALVE (T9) and SEC EMER CX FEED (T10)

ENG 3 - TANK VALVE (T12) and EMER & RX FEED (T13)

ENG 2 PRI EMER (R18)

(2) Turn on electrical power (Ref. 24-00-00). Verify that ENG 1, ENG 2, and ENG 3 FUEL PRESSURE lights on Flight Engineer/Second Officers FUEL SYSTEM panel, zone 215, are on.

(3) On LIGHTS control panel, zone 215, depress and latch WARNING CAUTION ADVISORY - TEST switchlight. Verify that all FUEL SYSTEM panel indicator lights come on. Depress and unlatch switchlight to turn off lights.

(4) Depress and latch ENG 1 TANK VALVE, ENG 2 TANK VALVE, and ENG 3 TANK VALVE switchlights to open tank valves. Verify the following:

(a) Switchlight flow bars come on.

(b) Blue disagreement light is on while valve is in transit.

(5) Depress and latch left TANK 1 PUMPS switchlight to turn
R on tank No. 1 outboard boost pump. Verify that the
R switchlight flow bar comes on.

(6) Depress and unlatch left TANK 1 PUMPS switchlight to
R turn off tank No. 1 outboard boost pump. Verify that
R the switchlight flow bar goes out.

(7) Depress and latch right TANK 1 PUMPS switchlight to
R turn on tank No. 1 inboard boost pump. Verify that the
R switchlight flow bar comes on.

(8) Depress and latch left TANK 1 PUMPS switchlight to turn on tank No. 1 outboard boost pump. Verify that engine No. 2 and 3 FUEL PRESSURE lights remain on.

(9) Depress and latch center CROSSFEED VALVES switchlight
R to open center crossfeed valve. Verify that the
R switchlight flow bar comes on.

(10) Depress and latch left CROSSFEED VALVES switchlight to
R open left crossfeed valve. Verify that the switchlight
R flow bar comes on.

(11) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open circuit breakers INBD BOOST PUMP - TANK 1 and OUTBD BOOST PUMP 1. Verify the following:

(a) Boost pump LOW pressure lights in both TANK 1 PUMPS switchlights come on.

(b) Engine No. 1, 2, and 3 FUEL PRESSURE lights come on.

(12) Depress and unlatch both TANK 1 PUMPS switchlights to open boost pump switches. Verify the following:

(a) LOW pressure lights go out.

(b) Switchlight flow bars go out.

(13) Depress and unlatch left and center CROSSFEED VALVES switchlights to close left and center crossfeed valves. Verify the following:

(a) Blue disagreement lights come on while valves are in transit.

(b) Switchlight flow bars go out.

(14) Depress and latch right TANK 3 PUMPS switchlight to turn on tank No. 3 outboard boost pump. Verify that the switchlight flow bar comes on.

(15) Depress and unlatch right TANK 3 PUMPS switchlight to turn off tank No. 3 outboard boost pump. Verify that the switchlight flow bar goes out.

(16) Depress and latch left TANK 3 PUMPS switchlight to turn on tank No. 3 inboard boost pump. Verify that the switchlight flow bar comes on.

(17) Depress and latch right TANK 3 PUMPS switchlight to turn on tank No. 3 outboard boost pump. Verify that engine No. 1 and 2 FUEL PRESSURE lights remain on.

R (18) Depress and latch center CROSSFEED VALVES switchlight to open center crossfeed valve. Verify that the switchlight flow bar comes on.

(19) Depress and latch right CROSSFEED VALVES switchlight to open right crossfeed valve. Verify that the switchlight flow bar comes on.

(20) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open circuit breakers INBD BOOST PUMP - TANK 3 and OUTBD BOOST PUMP - 3. Verify the following:

(a) Boost pump LOW pressure lights in both TANK 3 PUMPS switchlights come on.

(b) Engine No. 1, 2, and 3 FUEL PRESSURE lights come on.

(21) Depress and unlatch both TANK 3 PUMPS switchlights to open boost pump switches. Verify the following:

(a) LOW pressure lights go out.

(b) Switchlight flow bars go out.

(22) Depress and unlatch right and center CROSSFEED VALVES switchlights to close right and center crossfeed valves. Verify the following:

(a) Blue disagreement lights come on while valves are in transit.

(b) Switchlight flow bars go out.

(23) Depress and latch left TANK 2L PUMPS switchlight to turn on tank No. 2L outboard boost pump. Verify that the switchlight flow bar comes on.

(24) Depress and unlatch left TANK 2L PUMPS switchlight to turn off tank No. 2L outboard boost pump. Verify that the switchlight flow bar goes out.

(25) Depress and latch right TANK 2L PUMPS switchlight to turn on tank No. 2L inboard boost pump. Verify that the switchlight flow bar comes on.

(26) Depress and latch left TANK 2L PUMPS switchlight to turn on tank No. 2L outboard boost pump. Verify that engine No. 1 and 3 FUEL PRESSURE lights remain on.

(27) Depress and latch right CROSSFEED VALVES switchlight to open right crossfeed valve. Verify that the switchlight flow bar comes on.

(28) Depress and latch left CROSSFEED VALVES switchlight to open left crossfeed valve. Verify that the switchlight flow bar comes on.

(29) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open circuit breakers INBD BOOST PUMP - TANK 2L and OUTBD BOOST PUMP - TANK 2L. Verify the following:

(a) Boost pump LOW pressure lights in both TANK 2L PUMPS switchlights come on.

(b) Engine No. 1, 2, and 3 FUEL PRESSURE lights come on.

(30) Depress and unlatch both TANK 2L PUMPS switchlights to open boost pump switches. Verify the following:

(a) LOW pressure lights go out.

(b) Switchlight flow bars go out.

(31) Depress and unlatch left and right CROSSFEED VALVES switchlights to close left and right crossfeed valves. Verify the following:

(a) Switchlight flow bars go out.

(b) Blue disagreement lights come on while valves are in transit.

(32) Depress and latch right TANK 2R PUMPS switchlight to turn on tank No. 2R outboard boost pump. Verify that the switchlight flow bar comes on.

(33) Depress and unlatch right TANK 2R PUMPS switchlight to turn off tank No. 2R outboard boost pump. Verify that the switchlight flow bar goes out..

R (34) Depress and latch left TANK 2R PUMPS switchlight to turn on tank No. 2R inboard boost pump. Verify that the switchlight flow bar comes on.

(35) Depress and latch right TANK 2R PUMPS switchlight to turn on tank No. 2R outboard boost pump. Verify the following:

(a) Engine No. 1 and 3 FUEL PRESSURE Lights remain on.

(36) Depress and latch left CROSSFEED VALVES switchlight to open left crossfeed valve. Verifythat the switchlight flow bar comes on.

(37) Depress and latch right CROSSFEED VALVES switchlight to open right crossfeed valve. Verifythat the switchlight flowbar comes on.

(38) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open circuit breaker INBD BOOST PUMP - TANK 2R TANK and OUTBD BOOST PUMP - TANK 2R. Verify the following:

(a) Boost pump LOW pressure lights in both TANK 2R PUMPS switchlights come on.

(b) Engine No. 1, 2, and 3 FUEL PRESSURE lights come on.

(39) Depress and unlatch both TANK 2R PUMPS switchlights to open boost pump switches. Verify the following:

(a) LOW pressure lights go out.

(b) Switchlight flow bars go out.

(40) Depress and unlatch left and right CROSSFEED VALVES switchlights to close left and right crossfeed valves. Verify the following:

(a) Switchlight flow bars go out.

(b) Blue disagreement lights come on while valves are in transit.

(41) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, close all boost pump circuit breakers.

(42) On Flight Engineer/Second Officers FUEL SYSTEM panel, zone 215, close engine No. 1, 2, and 3 tank valves by depressing and unlatching ENG 1 TANK VALVE, ENG 2 TANK VALVE, and ENG 3 TANK VALVE switchlights. Verify the following:

(a) Switchlight flow bars go out.

(b) Blue disagreement lights come on while valves are in transit.

(43) Depress and latch switchlights to turn on tank No. 1, 2, and 3 fuel boost pumps. Verify that engine No. 1, 2, and 3 FUEL PRESSURE lights remain on.

(44) Depress and unlatch switchlights to turn off tank No. 1, 2 and 3 fuel boost pumps.

(45) Depress and latch engine No. 1, 2, and 3 tank valve switchlights to open valves. Verify the following:

(a) Switchlight flow bars come on.

(b) Blue disagreement lights come on while valves are in transit.

R (46) On pilots overhead circuit breaker panel CB1, zone 210,
R open circuit breakers FUEL SHUTOFF VALVE - TANK ENG 1
R (D10), or ENG 3 (D12).

(47) On pilots overhead circuit breaker panel CB1, zone 210, open the following circuit breakers:

FIRE EXTINGUISHER - ENG 1 MAIN and ALTN (C10 and C11)

FIRE EXTINGUISHER - ENGINE 2 MAIN and ALTN (C12 and C13)

FIRE EXTINGUISHER - ENG 3 MAIN and ALTN (C14 and C15)

ENGINE - B START IGN - 1, 2, and 3 (F13 through F15)

(48) On pilots overhead panel, zone 210, pull engine No. 1 FIRE PULL handle. Verify that the engine EMERGENCY SHUTOFF light comes on while valve is in transit (Flowbar light in ENG 1 TANK VALVE will go out).

(49) Turn on tank No. 1 boost pumps. Verify that FUEL PRESSURE light remains on.

(50) Turn off tank No. 1 boost pumps.

(51) Push in engine No. 1 FIRE PULL handle. Verify that EMERGENCY SHUTOFF light comes on while valve is in transit (Flowbar light in ENG 1 TANK VALVE switchlight will come back on).

R (52) On pilots overhead circuit breaker panel CB1, zone 210, close applicable circuit breaker opened in Step 3A(46).

(53) Pull engine No. 1 FIRE PULL handle. Verify the following:

(a) Flowbar light in ENG 1 TANK VALVE switchlight goes out; blue disagreement light comes on while engine No. 1 tank valve is in transit.

(b) EMERGENCY SHUTOFF light comes on and then goes out.

(54) Push in FIRE PULL handle. Verify the following:

(a) Flowbar light in ENG 1 TANK VALVE switchlight comes on; blue disagreement light comes on while engine No. 1 tank valve is in transit.

(b) EMERGENCY SHUTOFF light comes on and then goes out.

(55) Perform the following,

(a) Repeat Steps 3A(48) through 3A(54) to check FIRE PULL handle closure of engine No. 3 tank valve.

(b) Check closure of engine No. 2 tank valve using ENG. 2 TANK VALVE switchlight on FE/SO FUEL SYSTEM panel. Switchlight flowbar light must go out when switchlight is depressed to close valve. It must

come back on when switchlight is depressed to open valve. The blue disagreement light must blink on, then off, as valve moves to closed or open position.

(c) On pilots overhead panel, zone 210, pull engine No. 2 FIRE PULL handle and verify that both EMERGENCY SHUTOFF lights come on while the valves are in transit and then go off.

(d) Push in fire pull handle and verify that both EMERGENCY SHUTOFF lights come on while the valves are in transit and then go off.

(56) Turn off electrical power (Ref. 24-00-00).

(57) Close circuit breakers opened in Steps 3A(47).

ENGINE FUEL FEED SYSTEM - INSPECTION AND CHECK

1. General

The following inspection and check is used as a criteria in determining the serviceability of damaged engine fuel feed line
C assemblies installed in the No. 1 and No. 3 engine pylons and in
C determining adequate clearance between fuel lines and hydraulic
C lines in the No. 1 and No. 3 engine pylons.

2. Inspection/Check

C A. Pylon Fuel Feed Line Damage Inspection

(1) Replace engine fuel feed line assemblies when an inspection reveals the following damage:

C (a) A dent within 2 inches of the tube ends,
C weldments, or fittings that exceeds 0.030 inch in
C depth.

C (b) Any two dents that are closer than 3 times the
C width of the larger dent that do not exceed 0.060
C inch in depth.

C (c) Any dent that exceeds 0.125 inch in depth or
C having a length and width that exceeds 1.250 inch.
C The radius at the bottom of any dent that is
C otherwise considered acceptable must be greater
C than 0.031 inch.

C NOTE: A dent that exceeds any of the four
C parameters (depth, length, width, or
C radius) is cause for rejection.

C (2) Burnish out to a length 10 times the depth, any
C scratches, notches, or gouges that do not exceed 0.010
C inch in depth. Depths greater than 0.010 inch are
C cause for replacement.

(3) Tighten fuel line support clamps to a torque of 10-20 lb in. (Do not exceed 20 lb in.).

CR B. No. 1 and No. 3 Pylon Fuel Line and Hydraulic Line Clearance
CR and Chafing Check between Pylon Stations PS89 and PS166.

C (1) Open pylon access plates.

C (a) At No. 1 engine pylon, open access plates 452CT, C 452BT, 452AT, and 451BT.

C (b) At No. 3 engine pylon, open access plates 462CT, C 462BT, 462AT, and 461BT.

C NOTE: AD 89-20-07 APPLIES TO FOLLOWING PARAGRAPHS (2) THRU C (5).

C (2) Check the hydraulic and fuel line clearances between C Pylon Stations PS89 and PS166 for following:

C NOTE: Preloading the tubing to obtain the required C clearance is not acceptable.

C (a) 0.25 inch minimum clearance between the fuel line C and hydraulic lines.

C NOTE: If any fuel feed line or hydraulic line C requires replacement, a minimum of 0.50 C inch clearance must then be provided C between the replaced line and the adjacent C lines. This condition would supersede the C previous fuel line/hydraulic line clearance C limits.

C (b) 0.125 inch minimum clearance of a fuel line to C adjacent structure except at the clamp support C mount bracket and associated attachment structure C (Ref. L1011 Maintenance Manual, 20-29-01, Pg. 204, C Fig. 202).

C (c) 0.25 inch minimum clearance between a hydraulic C line to adjacent hydraulic line.

C NOTE: 0.10 inch minimum clearance between C hydraulic tube and "B" nut repair on C adjacent hydraulic tube if "B" nut C installation is within six inches of a C support clamp.

C (d) 0.25 inch minimum clearance between a hydraulic C line to adjacent structure except at the clamp C mount support bracket and associated attachment C structure.

C (e) 0.06 inch minimum clearance between both a fuel C and hydraulic line and adjacent clamp mount C support bracket and associated attachment C structure (Ref. L-1011 Maintenance Manual, C 20-29-01, Pg. 204, Fig. 202).

C CR C C C C (3) Check the security of the fuel and hydraulic line clamps between Pylon Stations PS89 and PS166. If any loose worn or damaged clamps are encountered, loosen the clamp and check for line wear under the clamp. Replace the clamp and repair any line discrepancies as required.

C C C NOTE: The replacement cushioned clamps should have a red silicone cushion. The clamp band should be stainless steel.

C CR (4) Check for evidence of any chafing of the pylon fuel feed lines between Pylon Stations PS89 and PS166.

C (5) Reinstall pylon access plates.

C C C (a) At No. 1 engine pylon, reinstall access plates 452CT, 452BT, 452AT, and 451BT and return aircraft to normal.

C C C (b) At No. 3 engine pylon, reinstall access plates 462CT, 462BT, 462AT, and 461BT and return aircraft to normal.

FUEL BOOST PUMP HOUSING - REMOVAL AND INSTALLATION

1. General

The following procedures describe the sequential tasks required to remove and install the tank 1/3 and tank 2L/2R fuel boost pump housings. Included are procedures for replacing the electrical wiring and connector located at the top of each fuel boost pump and motor assembly cavity, and the bypass check valve.

2. Equipment and Materials

Preformed Packing

Grease, Fluorosilicone, Dow Corning FS-1291, or equivalent

Insulator, (Boost Pump Housing)

Insulator, (Boost Pump Housing)

Connector Assembly (Boost Pump Housing)

Offset Screwdriver (Required if Sundstrand Aviation, Service Bulletin No. 28-1 has not been incorporated)

Fuel Pump Phase Rotation Test Set, F-6808-TSF-3 (G/ITEL 28-24-24)

3. Referenced Procedures

	6-40-00	Exterior Doors and Panels
	12-11-11	Servicing - Underwing Pressure Fueling
	20-24-02	Crimped Electrical Contact - Removal and Installation
	24-32-03	Nickel-Cadmium Battery - Removal and Installation
R	24-00-00	Electrical Power - Description and Operation
	28-11-00	Fuel Tanks - Maintenance Practices
	28-20-01	WIG-O-FLEX Couplings - Maintenance Practices
	28-22-00	Defueling - Maintenance Practices

28-24-00	Engine Fuel Feed System - Adjustment and Test
28-24-02	Fuel Boost Pump and Motor - Removal and Installation
28-24-03	Boost Pump Check Valve Assembly - Removal and Installation
57-33-01	Outer Wing Box, Lower Access Doors - Removal and Installation

4. Removal/Installation

A. Preliminary Procedures

WARNING: VERIFY THAT AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS AND WORK STANDARDS RELATING TO TANK ENTRY (REF 28-11-00).

(1) Defuel applicable fuel tank (Ref. 28-22-00).

(2) On FE/SO FUEL SYSTEM panel, zone 215, verify that all fuel valve switchlights are in the valve closed position and that all blue valve disagreement lights are out.

(3) On FE/SO aft circuit breaker panel CB3, zone 215, open and tag all U3 through U15 inboard and outboard boost pump circuit breakers.

(4) Attach MAINTENANCE IN PROGRESS placard to FUEL SYSTEM panel.

R (5) Remove all electrical power (Ref. 24-00-00) and disconnect aircraft battery (Ref. 24-32-03).

(6) Remove tank access covers as required to purge tank (Ref. 57-33-01). Ensure that tank is sufficiently opened to allow free circulation of ventilating air. Purge tank (Ref. 28-11-00).

B. Removal (Tank 1 or Tank 3 Fuel Boost Pump Housing)

R CAUTION: BOOST PUMP ELECTRICAL CONNECTOR SUPPORT HOUSING
R MUST NOT BE SEPARATED FROM PUMP HOUSING SCROLL.
R THESE PARTS ARE ASSEMBLED USING A JIG TO ASSURE
R ALIGNMENT OF ELECTRICAL CONNECTORS ON HOUSING AND
R PLUG-IN BOOST PUMP AND MOTOR ELEMENT. BURNING OF
R ELECTRICAL CONNECTOR CAN RESULT FROM IMPROPER
R ENGAGEMENT OF PUMP MOTOR AND HOUSING ELECTRICAL
R CONNECTORS.

R (1) Perform preliminary procedures (Ref. Para. 4A).

R (2) Remove boost pump cover plate 531CB/631CB.

R (3) Remove both boost pump check valve assemblies (Ref.
R 28-24-03).

R (4) Remove both boost pump plug-in elements (Ref.
R 28-24-02).

R (5) If not already removed for tank purging, remove
R underwing access cover 531AB/631AB for access to tank 1
R or 3 boost pump housing (Ref. 6-40-00 and 57-33-01).

R (6) Wipe up any residual fuel remaining in pump box.

R (7) Remove T-shaped fuel pump outlet line connector as
R follows:

R (a) Remove connector support clamp fasteners from
R bracket mounted on aft wall of pump box. Remove
R support clamp.

R (b) Disassemble WIG-O-FLEX couplings (Ref. 28-20-01).

R (c) Remove connector to pump housing fasteners.

R (8) Disconnect fuel pressure sensing line at forward side
R of pump housing.

R (9) Remove fuel pressure sensing line installed between
R fitting on aft side of pump housing and aft wall of
R pump box. Cap fitting at pump box wall.

R (10) Disconnect two WIG-O-FLEX couplings at fuel scavenge
R system tee fitting (Ref. 28-20-01).

R (11) Using a phenolic or plastic scraper, remove fillet
R sealant at base of housing.

R (12) Remove wing lower surface access panels 541AB left
R wing, or 641AB right wing, (Ref. 6-40-00).

R (13) On aft side of rear wing beam, identify boost pump wiring and corresponding terminal modules. Record for use when wiring is reconnected. Also make a diagram of wire clamping and stowage at terminal module for use during reinstallation. Attach pull string to wires and secure opposite end of string to structure.

R (14) Remove clamps and disconnect boost pump wires at terminal modules. Disconnect boost pump ground wires from ground studs and pull wires free from phase detectors. Attach pull string to wires and secure opposite end of string to structure.

R (15) Disassemble wiring support connector at rear beam fitting as required to permit withdrawal of wires through conduit and into tank.

R (16) Disconnect wiring harness conduit at top of pump housing (2 places).

R (17) Remove 16 pump housing attach screws.

R (18) Lift pump housing out of pump box and pull wiring out of conduits. Untie wiring pull string and secure in a convenient location. Stow wiring in a loop and tie loops to pump housing. Remove pump housing from aircraft.

R (19) On the workbench, remove fuel scavenge system tee fitting and two fuel pressure sensing port fittings. Retain all parts, except preformed packing, for reinstallation.

R (20) In the pump box, inspect insulator ring installed between pump housing and mounting plate (Ref. Fig. 401). If insulator ring is damaged or coming loose from mounting plate at any point, remove ring. Remove all faying surface sealant and clean mounting plate in preparation for installation of new ring.

R (21) Remove all sealant residue and clean the pump box area.

R C. Installation (Tank 1 or Tank 3 Fuel Boost Pump Housing)

R (1) On workbench, install two fuel pressure sensing line attach fittings.

R NOTE: Where installation of new preformed packing is specified, always lubricate packing with a film of flourosilicone grease.

(2) Using new preformed packing at mounting flange, install fuel scavenge system port tee fitting.

(3) If new insulator ring is required between pump housing and mounting plate, apply film of sealant (Ref. 28-11-00) to one side of new ring and place it in position on mounting plate. Press ring down against plate. Remove any sealant that exudes into pump attach screw holes.

(4) Install new preformed packing in pump housing mounting flange and place new pump housing in its installed position. Install 16 pump housing attach screws.

(5) Install fillet seal around the base of pump housing (Ref. Fig. 401).

(6) Attach stowed pull strings to boost pump wiring and pull wiring through respective conduits into area just behind wing rear beam. Connect conduit B-nuts to pump housing.

(7) Connect fuel pressure sensing lines to pump housing.

(8) Reconnect fuel scavenge system lines to the outlet port tee fitting by reassembling the two WIG-O-FLEX couplings (Ref. 28-20-01).

(9) Using new preformed packing at mounting flange, attach T-shaped fuel outlet line connector to pump housing.

(10) Connect fuel lines to connector by reassembling WIG-O-FLEX couplings at each connection (Ref. 28-20-01).

(11) Reinstall connector support clamp. If there was a spacer between the clamp and support bracket, be sure spacer is reinstalled.

(12) Before evacuating tank area, be certain all tools, equipment, and materials are removed. Thoroughly clean all debris and loose material from rework area.

(13) Onaft side of wing rear beam, route boost pump wiring
R to respective terminal modules. Install crimped
R contact pins if not already installed (Ref. WDM
R 20-03-01).

R NOTE: Do not cut any length from boost pump wires.

Insert wires into respective terminal module
R receptacles (Ref. 20-24-02 and WDM 28-24-01 and

28-24-04). Route boost pump ground wires through respective phase detectors to ground studs. Install terminal lugs and connect wires to studs (Ref. WDM 28-24-01 and 28-24-04). Install wire clamps in same location noted during removal.

(14) While taking care that wiring in conduit remains slack, reassemble wiring support connector at wing rear beam.

(15) Reinstall fuel boost pump check valve assemblies (Ref. 28-24-03).

(16) In MESC verify RCCB 13 and RCCB 14 (Tank 1) or RCCB 15 and RCCB 16 (Tank 3) are open as applicable.

(17) Check resistance between pin 4 of electrical plug at top of inboard pump cavity and ground. Resistance must be less than 2 ohms.

(18) Verify that there is no continuity between pin 4 and pins 1, 2, or 3 of the electrical plug at the top of the inboard pump cavity.

(19) Repeat steps (17) and (18) on outboard pump cavity electrical plug.

(20) Insert fuel pump phase rotation test set (F-6808-TSF-3) in inboard boost pump cavity. Be certain that test set connector is properly engaged to boost pump electrical plug at top of pump cavity.

(21) Connect boost pump element to connector on test set switch box. Verify that switch is in OFF position.

(22) Reconnect aircraft battery (Ref. 24-32-03).

(23) Turn on electrical power (Ref. 24-00-00).

(24) On FE/SO aft circuit breaker panel CB3, zone 215, remove tags and close the following applicable circuit breakers:

INBD PUMP IND (U1 or U2)

INBD BOOST PUMP 1, or 3 (U7 or U10)

OUTBD BOOST PUMP 1 or 3, and IND (U13 thru U15)

(25) On FE/SO FUEL SYSTEM panel depress applicable tank 1 or 3 TANK PUMPS switchlight. Verify that switchlight flowbar and LOW light come on.

NOTE: In the following step, allow pump to operate only long enough to verify pump rotation.

(26) Close test set switch and verify that pump rotation agrees with arrow on pump housing. Open test set switch.

(27) Release TANK PUMPS switchlight. Verify flowbar and LOW lights go out.

(28) Remove test set and install in outboard pump cavity. Remove tags and close applicable boost pump and indicator circuit breakers [Ref. Step (23)].

(29) Repeat Steps (25) through (27) using applicable TANK PUMP switchlight.

(30) Remove test set from boost pump housing.

(31) Reinstall boost pump elements (Ref. 28-24-02).

(32) Reinstall tank access covers (Ref. 57-33-01).

(33) Reinstall wing access panel 541AB/641AD (Ref. 6-40-00).

(34) Remove tags and close remaining circuit breakers opened in Step 4A(3).

(35) Refuel applicable tank (Ref. 12-11-11) and check boost pump operation (Ref. 28-24-00). Check boost pump installation for external leakage.

(36) Reinstall boost pump cover plate 531CB/631CB (Ref. 6-40-00).

D. Removal (Tank 2L or Tank 2R Fuel Boost Pump Housing)

CAUTION: BOOST PUMP ELECTRICAL CONNECTOR SUPPORT HOUSING MUST NOT BE SEPARATED FROM PUMP HOUSING SCROLL. THESE PARTS ARE ASSEMBLED USING A JIG TO ASSURE ALIGNMENT OF ELECTRICAL CONNECTORS ON HOUSING AND PLUG-IN BOOST PUMP AND MOTOR ELEMENT. BURNING AT ELECTRICAL CONNECTOR CAN RESULT FROM IMPROPER ENGAGEMENT OF PUMP MOTOR AND HOUSING ELECTRICAL CONNECTORS.

(1) Perform preliminary procedures (Ref. Para. A).

(2) Remove boost pump cover plate 532AB/632AB.

(3) Remove both boost pump check valve assemblies (Ref. 28-24-03).

(4) Remove both boost pump plug-in elements (Ref. 28-24-02).

(5) Remove underwing access panel 532BB/632BB for access to tank 2L/2R surge box area.

WARNING: BOOST PUMP SURGE BOXES IN TANK 2L AND 2R ARE IN RELATIVELY CONFINED AREAS NOT DIRECTLY EXPOSED TO THE PURGING AND VENTILATING AIR FLOW DIRECTED THROUGH THE MAJOR PORTION OF THE TANK. BEFORE WORKING IN SURGE BOX, PURGE BOX FOR APPROXIMATELY 20 MINUTES USING AN AIR MOVER. THEN THOROUGHLY VENTILATE AREA. MAINTAIN SURVEILLANCE OF LEL (LOWEST EXPLOSIVE LIMIT) CONDITION AND WEAR AN APPROVED AIRLINE RESPIRATOR WHEN WORKING IN SURGE BOX AREA (REF. 28-11-00).

(6) Wipe up any residual fuel remaining in pump box.

(7) Remove pump outlet line as follows:

(a) Disconnect Wiggins connector (Ref. 28-20-01).

(b) Remove pump outlet line to boost pump housing fasteners.

(8) Disconnect fuel pressure sensing lines at forward and aft sides of boost pump housing.

(9) Disconnect Wiggins couplings (2) at fuel scavenge system tee fitting.

(10) Disconnect wiring conduit B-nuts (2 places) at top of pump housing.

(11) Remove lower wing access panel 541GB/641GB (Ref. 6-40-00).

(12) Identify boost pump wiring and corresponding terminal modules. Record for use when wiring is reconnected. Also make reference diagram of wiring routing and clamp installations for use during reinstallation.

(13) Remove clamps and disconnect wiring from terminal modules. Disconnect boost pump ground wires from ground studs and pull wires free from phase detectors. Attach wires to a pull string and secure opposite end of string to structure.

(14) Disassemble wiring support connector at rear wing beam fitting as required to permit withdrawal of wires through conduit in tank area.

(15) Using a phenolic or plastic scraper, remove filler seal around base of pump housing.

(16) Remove 16 pump housing attach screws (Ref. Fig. 401).

(17) Lift pump housing out of pump box and pull wiring out of conduits. Untie pull string and secure in convenient location. Stow wiring in a loop and secure to pump housing.

(18) Remove pump housing from aircraft. On workbench, remove fuel scavenge system tee fitting and fuel pressure sensing port fittings (2). Retain all parts except preformed packing for reinstallation.

(19) In pump box, inspect insulator ring installed between pump housing and mounting plate (Ref. Fig. 401). If insulator ring is damaged or coming loose from mounting plate at any point, remove ring. Remove all faying surface sealant and clean mounting plate in preparation for installation of new ring.

(20) Remove all sealant residue and clean pump box area.

E. Installation (Tank 2L or Tank 2R Fuel Boost Pump Housing)

(1) On workbench, install two fuel pressure sensing line attach fittings.

NOTE: Where installation of new preformed packing is specified, lubricate packing with a film of flourosilicone grease.

(2) Using new preformed packing at mounting flange, install fuel scavenge system port tee fitting.

(3) If new insulator ring is required between pump housing and mounting plate, apply a film of sealant (Ref. 28-11-00) to one side of new ring and place in position on the mounting plate. Press ring down against plate. Remove any sealant that exudes into pump attach screw holes.

(4) Install new preformed packing in pump housing mounting flange and place new pump housing in its installed position. Install 16 pump housing attach screws.

(5) Install a fillet seal around base of pump housing (Ref. Fig. 401).

(6) Attach stowed pull strings to boost pump wiring and pull wiring through respective conduits into area just

behind wing rear beam. Connect conduit B-nuts to pump housing.

(7) Connect fuel pressure sensing lines to pump housing.

(8) Reconnect fuel scavenge system lines to outlet port tee fitting by reassembling two Wiggins couplings (Ref. 28-20-01).

(9) Using new preformed packing at mounting flange, attach fuel pump outlet line to pump housing.

(10) Connect fuel feed manifold to pump outlet line by reassembling Wiggins coupling (Ref. 28-20-01).

(11) Before evacuating tank area, be certain all tools, equipment, and materials are removed. Thoroughly clean all debris and loose material from rework area.

(12) On aft side of wing rear beam, route boost pump wiring
R to respective terminal modules. Install crimped
R contact pins if not already installed (Ref. WDM
R 20-03-01).

R NOTE: Do not cut any length from boost pump wires.

Insert wires into respective terminal board receptacles
R (Ref. 20-24-02 and WDM 28-24-02 and 28-24-03). Route boost pump ground wires through respective phase detectors to ground studs. Install terminal lugs and connect wires to studs (Ref. 28-24-02 and 28-24-03). Install wire clamps in same location noted during removal.

(13) Taking care that wiring in conduit remains slack, reassemble wiring support connector at wing rear beam.

(14) Reinstall fuel boost pump check valve assemblies (Ref. 28-24-03).

(15) In MESC, verify RCCB 11 and RCCB 12 (Tank 2L) or RCCB 17 and RCCB 18 (Tank 2R) are open as applicable.

(16) Check resistance between pin 4 of electrical plug at upper end of inboard boost pump cavity and ground. Resistance must be less than 2 ohms. Repeat check at plug in inboard pump cavity.

(17) Verify that there is no continuity between pin 4 and pins 1, 2, or 3 of the electrical plug at the top of the inboard pump cavity.

(18) Repeat steps (16) and (17) on outboard pump cavity electrical plug.

(19) Insert fuel pump phase rotation test set (F-6808-TSF-5) in inboard boost pump cavity. Be certain that test set connector is properly engaged to boost pump electrical plug at top of pump cavity.

(20) Connect boost pump element to connector on test set switch box. Verify that switch is in OFF position.

(21) Reconnect aircraft battery (Ref. 24-32-03).

(22) Turn on electrical power (Ref. 24-00-00).

(23) On FE/SO aft circuit breaker panel CB3, zone 215, remove tags and close the following applicable circuit breakers:

INBD PUMP IND (U1 or U2)

OUTBD BOOST PUMP 2L, 2R (U3, U4) or (U5, U6)

INBD BOOST PUMP 2L or 2R, (U8 or U9)

(24) On FE/SO FUEL SYSTEM panel depress applicable tank 2L or 2R TANK PUMPS switchlight. Verify that switchlight flowbar and LOW lights come on.

NOTE: In following step, allow pump to operate only long enough to check pump rotation.

(25) Close test set switch and verify that pump rotation agrees with arrow on pump housing. Open test set switch.

(26) Release TANK PUMPS switchlight.

(27) Remove test set and reinstall in outboard pump cavity. Remove tags and close applicable boost pump and indicator circuit breakers [Ref. Step (23)].

(28) Repeat Steps (25) and (26) for outboard boost pump using applicable TANK PUMP switchlight.

(29) Remove test set.

(30) Install boost pump plug-in elements.

(31) Reinstall tank access covers (Ref. 57-33-01).

(32) Reinstall wing access panel 541GB/641GB (Ref. 6-40-00).

(33) Refuel applicable tank and check boost pump operation (Ref. 28-24-00). Check boost pump installation for external leakage.

(34) Reinstall boost pump cover plate 532AB/632AB (Ref. 6-40-00).

5. Electrical Wiring and Connector Replacement

NOTE: This paragraph contains procedural steps for replacing male boost pump element electrical connectors located in boost pump assembly housings.

A. Procedure

(1) On FE/SO aft circuit breaker panel CB3, zone 215, open and tag applicable boost pump power circuit breaker (U4 thru U14) and attach MAINTENANCE IN PROGRESS placard to FUEL SYSTEM panel.

(2) Remove applicable boost pump cover plate 531CB/631CB, 532BB/632BB (Ref. 6-40-00).

(3) Remove applicable boost pump plug-in element (Ref. 28-24-02).

(4) Remove electrical connector attach bolts at upper end of pump and motor cavity.

(5) Open applicable lower wing panel 541AB/641AB or 541GB/641GB (Ref. 6-40-00).

(6) Identify boost pump wiring and corresponding terminal modules. Record for use when wiring is reconnected. Also make diagram of wire clamping and stowage for use during reassembly.

(7) Remove wiring clamps and disconnect wiring at terminal modules. Disconnect boost pump ground wires from ground studs and pull wires free from phase detectors. Attach wires to a pull string and secure opposite end of string to structure.

(8) Disassemble wiring connector at rear wing beam as required to permit withdrawal of wires through conduit in tank area.

(9) Pull electrical connector and wiring out of boost pump and motor cavity. Discard preformed packing at connector seat.

(10) Insert wiring of new connector and harness assembly through new pre-formed packing and seat packing on connector flange.

(11) Untie pull string from removed wiring and attach to
C wires of new electrical connector assembly (Sundstrand
C P/N 121-1296).

(12) Pull wiring through conduit into aft wing area while second man guides wires and connector into boost pump housing. Take care not to dislodge packing installed
R in previous step. Be certain connector flange bolt
R holes are aligned.

(13) Install connector attach bolts. Torque bolts 15 to 19 lb in.

(14) While taking care that wiring in conduit remains slack, reassemble wiring connector at rear wing beam. Route
R wires to applicable terminal module. Install crimped
R contact pins if not already installed (Ref. WDM
R 20-03-01).

R NOTE: Do not cut any length from boost pump wires.

R (15) Insert wires into module receptacles (Ref. 20-24-02 and WDM 28-24-01, 02, 03, 04). Route pump ground wires through respective phase detectors. Install terminal lugs and connect wires to studs.

(16) Install wire clamps in locations noted during removal.

(17) Reassemble wiring support connector at wing rear beam.

(18) Check resistance between pin 4 of electrical connector and ground. Resistance must be less than 2 ohms.

(19) Insert phase rotation test set (F-6808-TSF-3) in boost pump cavity. Be certain that test set connector is properly engaged to connector plug at top of pump housing.

(20) Connect boost pump plug-in element to connector on test set switch box. Verify that switch is in OFF position.

(21) On FE/SO aft circuit breaker CB3, zone 215, remove tags and close applicable boost pump power and boost pump indicator circuit breakers (U1 through U15).

(22) On FE/SO FUEL SYSTEM panel depress applicable TANK PUMPS switchlight. Verify that switchlight flowbar and LOW lights come on.

(23) Close test set switch and verify that pump rotation agrees with arrow on pump housing. Open test switch.

(24) Release TANK PUMPS switchlights. Verify flowbar and LOW lights go off.

(25) With an ohmmeter check for less than 2 ohms to ground from pin 4 of test set connector with switch on.

(26) Remove test set from boost pump housing.

(27) Reinstall plug-in boost pump element (Ref. 28-24-02).

(28) Reinstall tank access covers (Ref. 57-33-01).

(29) Reinstall wing access panel 541GB/641GB (Ref. 6-40-00).

(30) Check boost pump operation (Ref. 28-24-00).

(31) Check replaced boost pump installation for leakage.

(32) Reinstall boost pump cover plate removed in Step (2).

6. Bypass Valve Removal/Installation

A. Removal

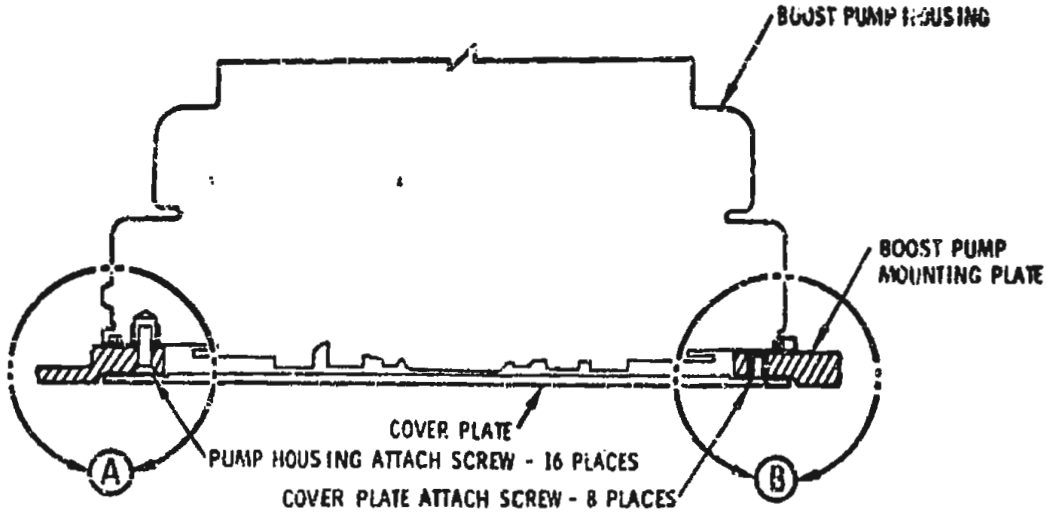
(1) Perform preliminary procedure (Ref. Para. 4A).

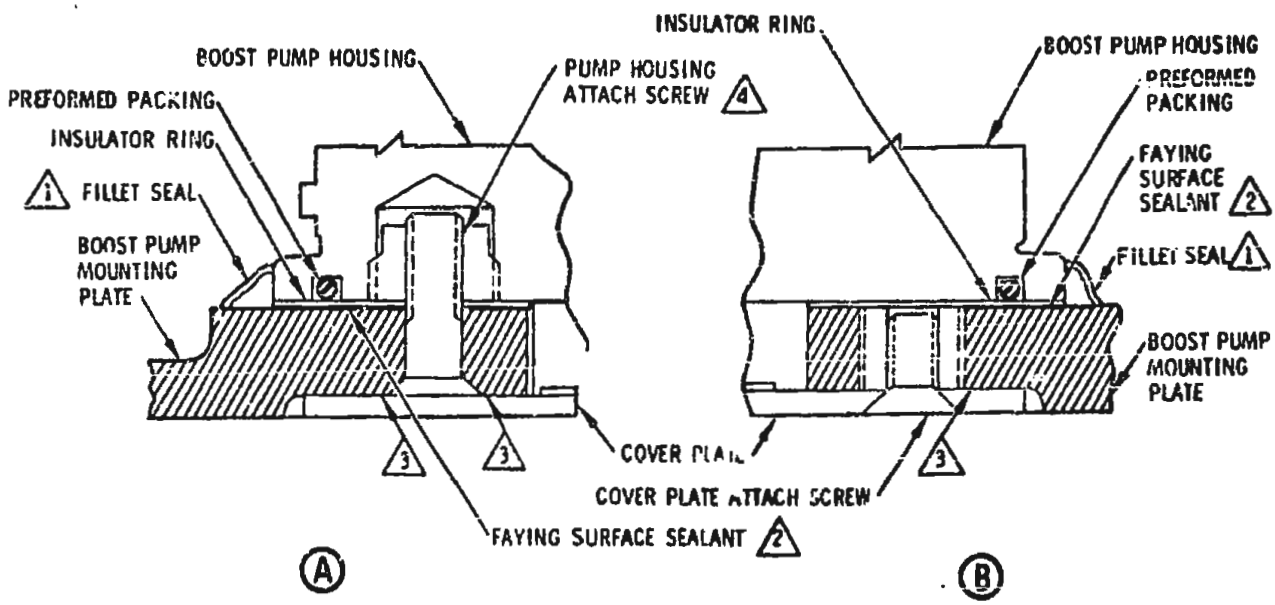
(2) If not already removed for tank purging, remove underwing access cover 531AB/631AB (tanks 1 or 3) or 532BB/632BB (tanks 2L or 2R) for access to boost pump housing (Ref. 6-40-00 and 57-33-01).

WARNING: BOOST PUMP SURGE BOXES IN TANK 2L AND 2R ARE IN RELATIVELY CONFINED AREAS NOT DIRECTLY EXPOSED TO THE PURGING AND VENTILATING AIR FLOW DIRECTED THROUGH THE MAJOR PORTION OF THE TANK. BEFORE WORKING IN SURGE BOX, PURGE BOX FOR APPROXIMATELY 20 MINUTES USING AN AIR MOVER. THEN THOROUGHLY VENTILATE THE AREA. MAINTAIN SURVEILLANCE OF THE LEL (LOWEST EXPLOSIVE LIMIT) CONDITION AND WEAR AN APPROVED AIRLINE RESPIRATOR WHEN WORKING IN THE SURGE BOX AREA (REF. 28-11-00).

(3) Wipe up any residual fuel remaining in pump box.

(4) Locate bypass valve on aft lower side of boost pump housing (Ref. Fig. 402).





NOTE

1. FILLET SEAL. INSTALL IN ACCORDANCE WITH FUEL TANK MAINTENANCE PRACTICES (REF. 28-11-00)
2. SEAL FAYING SURFACES BETWEEN INSULATOR AND MOUNTING PLATE. DO NOT ALLOW SEALANT TO ENTER FASTENER AREA (REF. 28-11-00) 4
3. ELECTRICAL BOND CONTACT AREA BETWEEN COVERPLATE AND PUMP MOUNTING PLATE. MAXIMUM ALLOWABLE RESISTANCE 0.0025 OHMS
4. TO PREVENT FLOW OF SEALANT INTO FASTENER INSERTS, DO NOT TIGHTEN DOWN HOUSING ATTACH SCREWS UNTIL ALL ATTACH SCREWS HAVE BEEN INSERTED AND SCREWED INTO INSERTS

M1-0102-28-361

CR CR Fuel Boost Pump Housing - Removal and Installation
Figure 401

(5) Remove screws from valve (use offset screwdriver if Sundstrand Service Bulletin No. 28-1 has not been accomplished).

(6) Remove bypass valve.

B. Installation

(1) Clean mating surfaces of bypass valve and housing (Ref. 28-11-00).

CAUTION: BE SURE VALVE SEAT, FLAPPER AND MOUNTING HOLES ARE FREE OF SEALING COMPOUND.

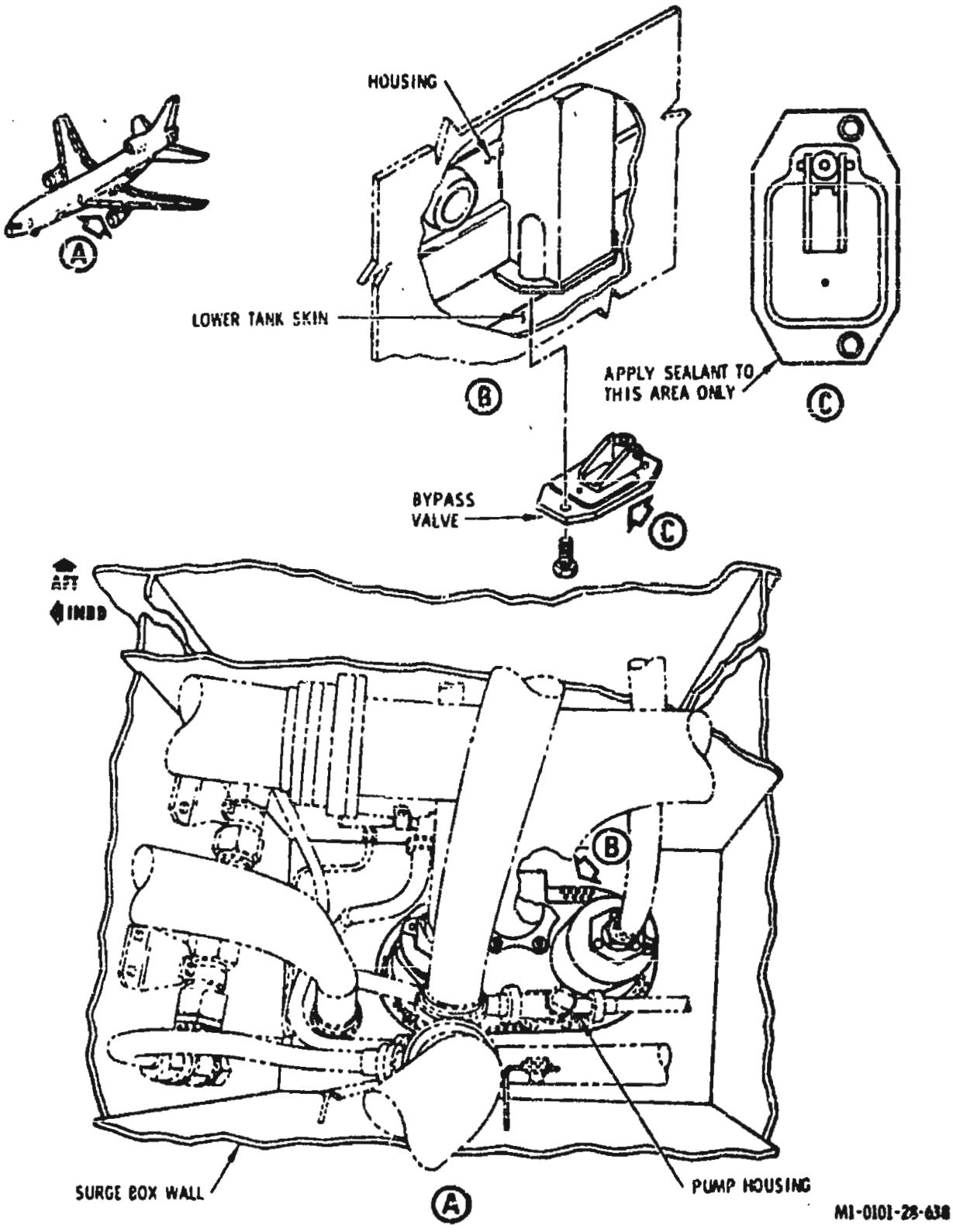
(2) Apply a thin bead of tank sealing compound (Ref. 28-11-00) to faying surface area of bypass valve that will be in contact with bypass valve opening on scroll housing.

(3) Carefully position bypass valve in its installed position.

(4) Insert screws and torque 38 to 45 inch pounds.

(5) Verify that valve flapper is free to move and that flapper and seat are free of sealing compound.

(6) Reinstall tank access covers removed in Step 4A(6) and 6A(2).



CR CR Boost Pump Bypass Valve - Removal and Installation
Figure 402

R R 001B EFFECTIVITY: ALL

CR

Fuel Boost Pumps - Maintenance Practices

CR 1. Open Phase Detector Deactivation

CR A. The following may be used to deactivate boost pump open phase detectors to facilitate boost pump low pressure light trouble shooting:

CR NOTE: 1) MO 70L81 removes the phase detectors from the L1011 fleet.

CR NOTE: 2) Reference M/M 28-24-00 Figure 102, Sheet 6 for phase detector and respective terminal block location.

CR NOTE: 3) Assure that the respective boost pump CB is pulled prior to deactivation.

CR a. Deactivate the phase detector by removing the two each detector wires from the adjacent terminal block. Tape and stow the removed wires.

CR b. The ground wire from the respective boost pump that runs thru the phase detector need not be removed for detector deactivation.

FUEL BOOST PUMP AND MOTOR - REMOVAL AND INSTALLATION

1. General

Two fuel boost pump and motor modules are installed in each of the four boost pump assembly housings. The pump motor electrical connector is automatically disconnected when the pump and motor assembly is withdrawn from its recess in the housing. A sleeve-type fuel inlet shutoff valve, is rotated and partially extended from the housing with the pump and motor. A spring-loaded index pin and tang aligns the inlet valve and retains it in the position that shuts off the pump fuel inlet and outlet ports. A retaining plate prevents further extension of the inlet valve. An indexing pin, attached to the inlet valve, assures realignment of the fuel inlet and outlet ports and mating of the electrical connector when the pump and motor are inserted into the canister housing.

CR Fuel Boost Pump and Remote Control Circuit Breaker (RCCB)
CR Replacement. The fuel boost pump RCCB installed in the
CR aircraft may be either a TI RCCB or a Cutler Hammer RCCB. The
CR TI RCCB may be identified by a red body and has a re-set button
CR on the top of the unit whereas the CH RCCB has a black body with
CR no re-set button. Also the TI RCCB is a 15 AMP unit and the CH
CR RCCB is a 20 AMP unit and both are stocked under the same stock
CR number. It is a standard practice to replace the RCCB any time
CR a boost pump is replaced. This replacement is not necessary if
CR a CH RCCB is already installed in the respective pump circuit.

2. Equipment and Materials

Hand-held 1-gallon container

Grease, Fluorosilicone, Dow Corning FS-1291, or equivalent

O-ring seals (Ref. Fig. 401)

Connector ES 5126, Electronic Seals, or equivalent

3. Referenced Procedures

6-40-00	Exterior Access Doors and Panels
12-11-00	Servicing - Maintenance Practices
24-41-00	External Power/Ground Service System - Maintenance

4. Removal/Installation (Pump and Motor)

A. Removal

WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF. 12-11-00).

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag the applicable circuit breaker for the pump and motor being replaced.

(2) Remove applicable access cover for pump and motor being replaced (Ref. 6-40-00).

WARNING: A FUEL SPILL CAN OCCUR IF THE FOLLOWING STEPS ARE NOT DONE EXACTLY AS LISTED AND IN THE ORDER NOTED. REMOVE ONLY THOSE SCREWS CALLED OUT FOR REMOVAL IN PROCEDURAL STEPS.

(3) Remove the three fillister head screws and washers which secure the pump and motor to the boost pump assembly housing (Ref. Fig. 401).

(4) Using the handle on the pump mounting flange, pull the pump and motor, along with the inlet valve, out of the housing to a point where disengagement of the inlet valve indexing pin permits clockwise rotation of the unit.

R WARNING: DO NOT SEPARATE PUMP AND MOTOR ELEMENT FROM INLET VALVE BEFORE ROTATING UNIT 20 DEGREES CLOCKWISE AS DIRECTED IN FOLLOWING STEP 4A(5).

R (5) Rotate pump and motor 20 degrees clockwise to a point where the inlet valve indexing tang clears the pump and motor flange and retracts to engage a mating recess in the inlet valve flange.

(6) Remove plug and drain trapped fuel into a container. Reinstall plug.

WARNING: DRAINING IS SLOW (APPROXIMATELY FOUR MINUTES). IF FUEL CONTINUES TO FLOW AT SAME RATE FOR LONGER THAN FOUR MINUTES DO NOT REMOVE PUMP. SUSPECT INLET VALVE SEALS DEFECTIVE. REPLACE DEFECTIVE SEALS (REF. PARA. 5).

(7) Remove two countersunk screws to separate the pump and motor from the inlet valve.

(8) Withdraw the pump and motor assembly out of the inlet valve.

B. Installation

(1) Verify that circuit breaker opened in Step 4A(1) is opened and tagged.

(2) Install new O-ring seal on pump and motor (Ref. Fig. 401). Lubricate seal with fluorosilicone grease.

(3) Verify that fuel drain plug is tightened to 10 to 16 lb in.

(4) Inspect electrical connectors as follows:

(a) Using male connector or other suitable tool, check that pump female connector cannot rotate within its shell. (Connector tang is somewhat fragile, do not use excessive force.)

(b) Inspect male connector, located at top of the housing well, for signs of damage or burned pins.

(c) Check that synthetic insert from removed pump female connector is not lodged in male connector.

(5) Insert pump and motor into the inlet valve. Using two countersunk screws, attach pump and motor to inlet valve flange. Torque screws 25 to 30 lb in. R

(6) While holding the spring-loaded indexing tang extended to clear pump and motor flange, rotate pump and motor counterclockwise until inlet valve indexing pin engages the mating hole in the pump housing.

(7) Push pump and motor assembly, and inlet valve fully into the housing using hand force only until there is metal-to-metal contact between the inlet valve flange and the housing. (The inlet valve may spring back upon removal of hand force until approximately 1/16-inch gap exists between inlet valve flange and housing.)

R R R R R **CAUTION:** THE THREE FILLISTER HEAD SCREWS MUST NOT BE INSERTED UNLESS THE METAL-TO-METAL CONTACT HAS FIRST BEEN ACHIEVED (REF. FIG. 401). FAILURE TO ATTAIN METAL-TO-METAL CONTACT, USING HAND FORCE ONLY, MAY RESULT IN IMPROPER OR INADEQUATE ELECTRICAL CONNECTOR ENGAGEMENT WHICH CAN CAUSE FAILURE OF THE PUMP.

(8) Attach pump and motor to inlet valve flange with three fillister head screws and washers. Torque screws 27 to 33 lb in.

(9) Turn on electrical power (Ref. 24-41-00).

(10) Remove tag and close circuit breaker opened in Step 4A(1).

(11) On Flight Engineer/Second Officers FUEL SYSTEM panel, zone 215, verify that flow bar lights in the crossfeed and engine tank valve switchlights are out.

(12) Depress applicable tank pump switchlight to operate replaced pump and motor assembly. Verify that ON light comes on and that LOW light goes out.

(13) Check pump and motor installation for signs of fuel leakage.

(16) Again depress pump and motor control switchlight. Verify that ON light goes out and that LOW light comes on.

(15) Turn off electrical power (Ref. 24-41-00).

(16) Reinstall pump and motor assembly access cover (Ref. 6-40-00).

5. Removal/Installation (Fuel Inlet Valve)

A. Removal

(1) Defuel applicable fuel tank (Ref. 28-22-00.

(2) Remove pump and motor assembly (Ref. Step 4A).

(3) Remove inlet flange retaining plate (Ref. Fig. 401).

(4) Rotate inlet valve to a position which allows the indexing pin tang to clear the inlet valve and retract.

(5) Withdraw the inlet valve out of the pump housing.

B. Installation

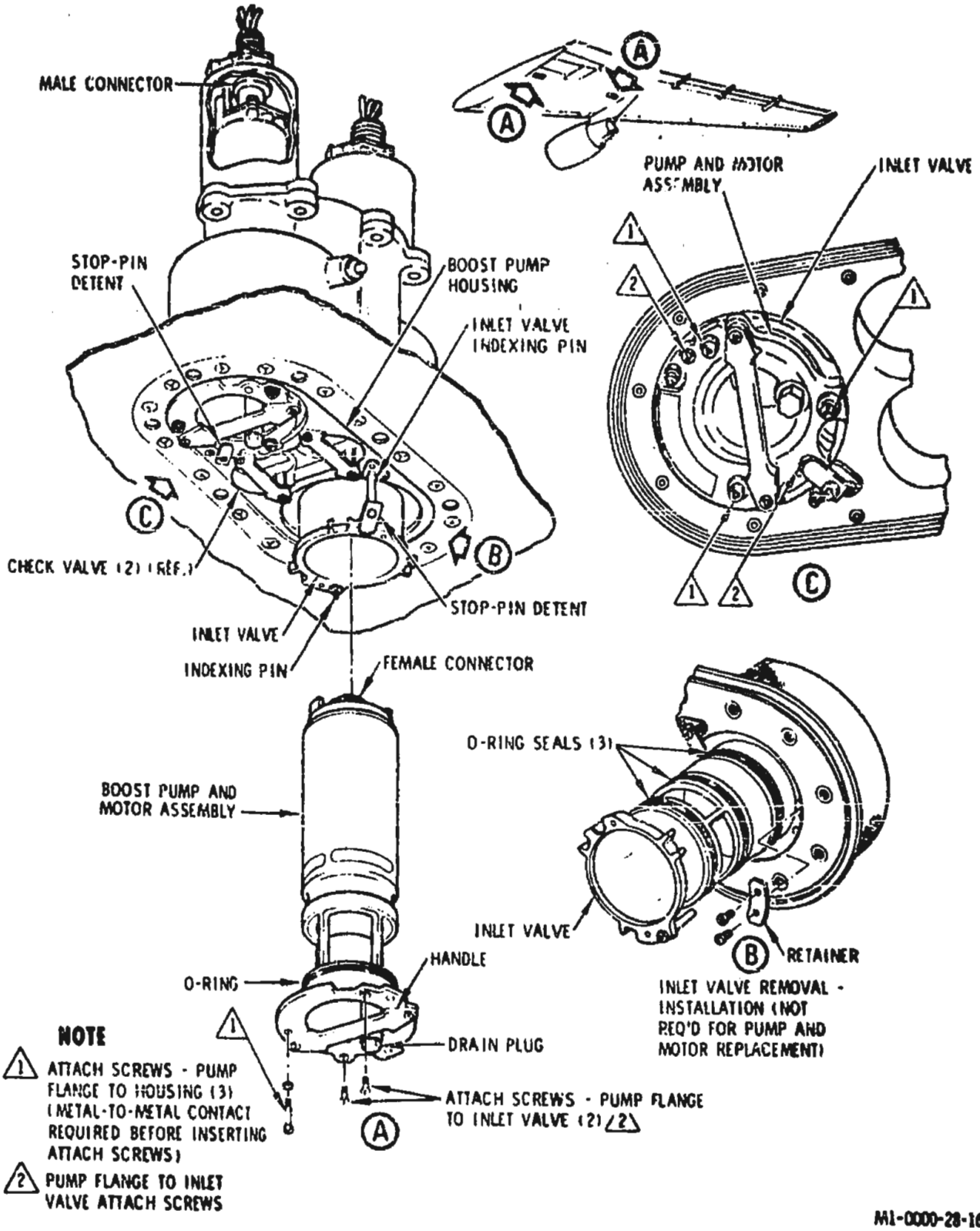
(1) Install new O-ring seals on fuel inlet valve (3 places). Lubricate seals with film of fluorosilicone grease.

(2) Insert inlet valve into pump housing.

(3) Extend indexing pin and rotate inlet valve to the position that engages indexing pin tang to recess in flange of inlet valve.

(4) Install inlet valve retaining plate. Tighten plate attach screws to a torque of 27 to 33 lb-in.

(5) Reinstall pump and motor assembly (Ref. Step 4B).


MALE CONNECTOR
STOP-PIN DETENT
BOOST PUMP HOUSING
INLET VALVE INDEXING PIN
CHECK VALVE (2) (REF.)
INLET VALVE INDEXING PIN
STOP-PIN DETENT
FEMALE CONNECTOR
BOOST PUMP AND MOTOR ASSEMBLY
O-RING
HANDLE
DRAIN PLUG
ATTACH SCREWS - PUMP FLANGE TO INLET VALVE (2) 2
PUMP AND MOTOR ASSEMBLY
INLET VALVE
O-RING SEALS (3)
INLET VALVE
RETAINER
INLET VALVE REMOVAL - INSTALLATION (NOT REQ'D FOR PUMP AND MOTOR REPLACEMENT)
NOTE
1 ATTACH SCREWS - PUMP FLANGE TO HOUSING (3) (METAL-TO-METAL CONTACT REQUIRED BEFORE INSERTING ATTACH SCREWS)
2 PUMP FLANGE TO INLET VALVE ATTACH SCREWS

MI-0000-28-1625

Fuel Boost Pump and Motor - Removal and Installation
Figure 401

BOOST PUMP CHECK VALVE ASSEMBLY - REMOVAL AND INSTALLATION

1. General

Two plug-in dual check valve assemblies are installed in each fuel boost pump housing. The aft check valve is the outboard pump check valve in Tank 1 and 2L boost pump assemblies and the inboard pump check valve in Tank 3 and 2R boost pump assemblies. Removal of check valve assemblies is necessary to facilitate inspection of fuel scavenge system screens. Defueling of the applicable tank is required before removing the valve.

2. Equipment and Materials

Preformed packing (Ref. Fig. 401)

Grease, Fluorosilicone, Dow Corning FS-1291, or equivalent

Hand-held container

3. Referenced Procedures

6-40-00	Exterior Access Doors and Panels
12-11-11	Underwing Pressure Fueling - Servicing
12-11-21	Gravity Fueling - Servicing
24-00-00	Electrical Power - Maintenance Practices
28-11-00	Tanks - Maintenance Practices
28-22-00	Defueling - Maintenance Practices

4. Removal/Installation

A. Removal

R WARNING: VERIFY THAT AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF. 28-11-00).

(1) Defuel applicable fuel tank (Ref. 28-22-00).

(2) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag EMER & LX FEED (T7), EMER & CX FEED (T10), and EMER & RX FEED (T13) circuit breakers. Open and tag all boost pump circuit breakers
R on Row V. Attach MAINTENANCE IN PROGRESS tag to FE/SO
R FUEL SYSTEM panel.

(3) Remove boost pump assembly access cover (Ref. 6-40-00).

(4) Remove check valve assembly to pump housing attach screws (Ref. Fig. 401).

(5) While holding container in position to catch trapped
R fuel, use handle to pull check valve assembly out of housing.

NOTE: Reject check valve assembly having damaged, frayed, or dented screen.

B. Installation

R (1) Verify that circuit breakers opened in Step 4A(1) are open and tagged.

NOTE: Before installing check valve assembly, be sure that fuel scavenge system screen is serviceable and free of all foreign materials.

(2) Lubricate preformed packing with film of flourosilicone grease.

(3) Install new preformed packing on check valve housing.

NOTE: When removing and installing shoulder screw nut, use hex socket wrench at lower end of screw to oppose torque applied to nut.

(4) Remove shoulder screw nut and lockwasher.

(5) Remove O-ring retainer, preformed packing, and O-ring cap.

(6) Reassemble components removed in step 4 and 5 using new pre-formed packing and O-ring cap.

(7) Install lockwasher and nut.

R (8) Tighten nut to a torque of 25 to 30 lb in.

R (9) Insert check valve assembly into pump housing.

(10) Install attach screws.

(11) Remove tags and close circuit breakers opened in Step 4A(2).

(12) Refuel applicable tank (Ref. 12-11-11, 12-11-21).

(13) On Flight Engineer/Second Officers FUEL SYSTEM panel, zone 215, verify that crossfeed valves and applicable fuel tank valve are closed.

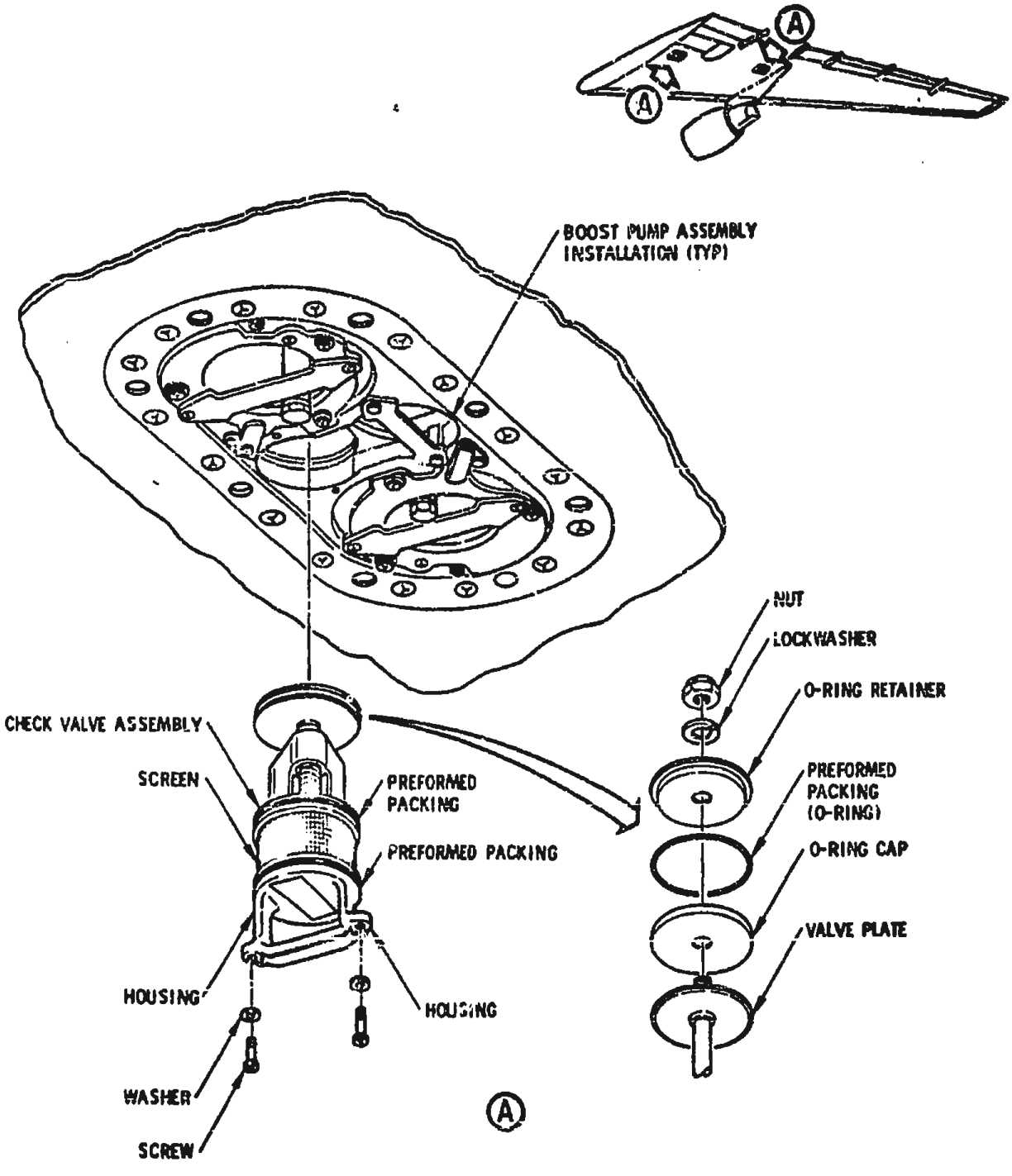
CR CR R CAUTION: IF BOOST PUMP CIRCUIT BREAKER TRIPS, DO NOT RESET UNTIL IT IS VERIFIED THAT CIRCUIT BREAKER TRIP IS NOT CAUSED BY MALFUNCTION IN BOOST PUMP ASSEMBLY.

(14) Turn on applicable boost pump and check for fuel leakage at replaced check valve assembly.

(15) Turn off boost pump.

(16) Turn off electrical power (Ref. 24-00-00).

(17) Reinstall boost pump assembly access cover (Ref. 6-40-00).



M3 0102-28-196

R Boost Pump Assembly Check Valve - Removal and Installation
R Figure 401

FIREWALL SHUTOFF VALVE, ENGINE NO. 1 OR 3 REMOVAL AND INSTALLATION

1. Equipment and Materials

Container (approved for fuel storage and transit)

Grease, Fluorosilicone, Dow Corning FS 1291, or equivalent

O-ring Seal (Ref. Fig. 401)

Omni-seal (Ref. Fig. 401)

Cleaner, LAC Spec C-32-337 or LCM 32-1087, or equivalent

Lint-free Cotten Rags, Fed Spec DDD-R-30, or equivalent

Sealing Compound, LAC Spec C-40-969, Type 1, Class A, or equivalent

2. Referenced Procedures

6-40-00	Exterior Access Doors and Panels
24-41-00	External Power/Ground Service System - Maintenance Practices
28-24-07	Firewall Shutoff Valve, Eng No. 1 and 3 - Adjustment and Test
71-00-01	LH or RH Wing-mounted QEC Unit - Removal and Installation

3. Removal/Installation

A. Removal

(1) Close applicable engine No. 1 or 3 tank valve by performing Step (a) or (b).

R (a) Open wing leading edge access door 511LB or 611LB (Ref. 6-40-00) and manually actuate tank valve override lever to the CLOSED position.

(b) Turn on electrical power (Ref. 24-41-00). On Flight Engineer/Second Officers FUEL SYSTEM panel, zone 215, actuate applicable engine tank valve

switchlight to close the tank valve. Turn off electrical power (Ref. 24-41-00).

(2) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag the following circuit breakers:

ENG 1 - TANK VALVE or ENG 3 - TANK VALVE (T6 or T12)

R ENG NO. 1 - EMER & L XFEED or ENG NO. 3 - EMER R XFEED (T7 or T13)

R INBD BOOST PUMP - TANK 1 or 3 (U1 or U10)

R OUTBD BOOST PUMP 1 or 3 (U13 or U14)

(3) Remove pylon access cover 452AT or 462AT (Ref. 6-40-00).

(4) Open LH hinged cowl (Ref. 6-40-00).

(5) Verify that firewall shutoff valve is open. If not open, actuate shutoff valve override lever to the OPEN position (Ref. Fig. 401).

(6) Remove drain plug and drain fuel inlet drain pipe at entrance elbow to engine-driven fuel pump (Ref. 71-00-01). Reinstall drain plug.

(7) Disconnect firewall shutoff valve electrical connector.

(8) Remove fuel inlet and outlet pipe attach bolts, washers, and bonding jumper.

(9) Carefully slide valve housing out of its installed position between inlet and outlet pipe flanges.

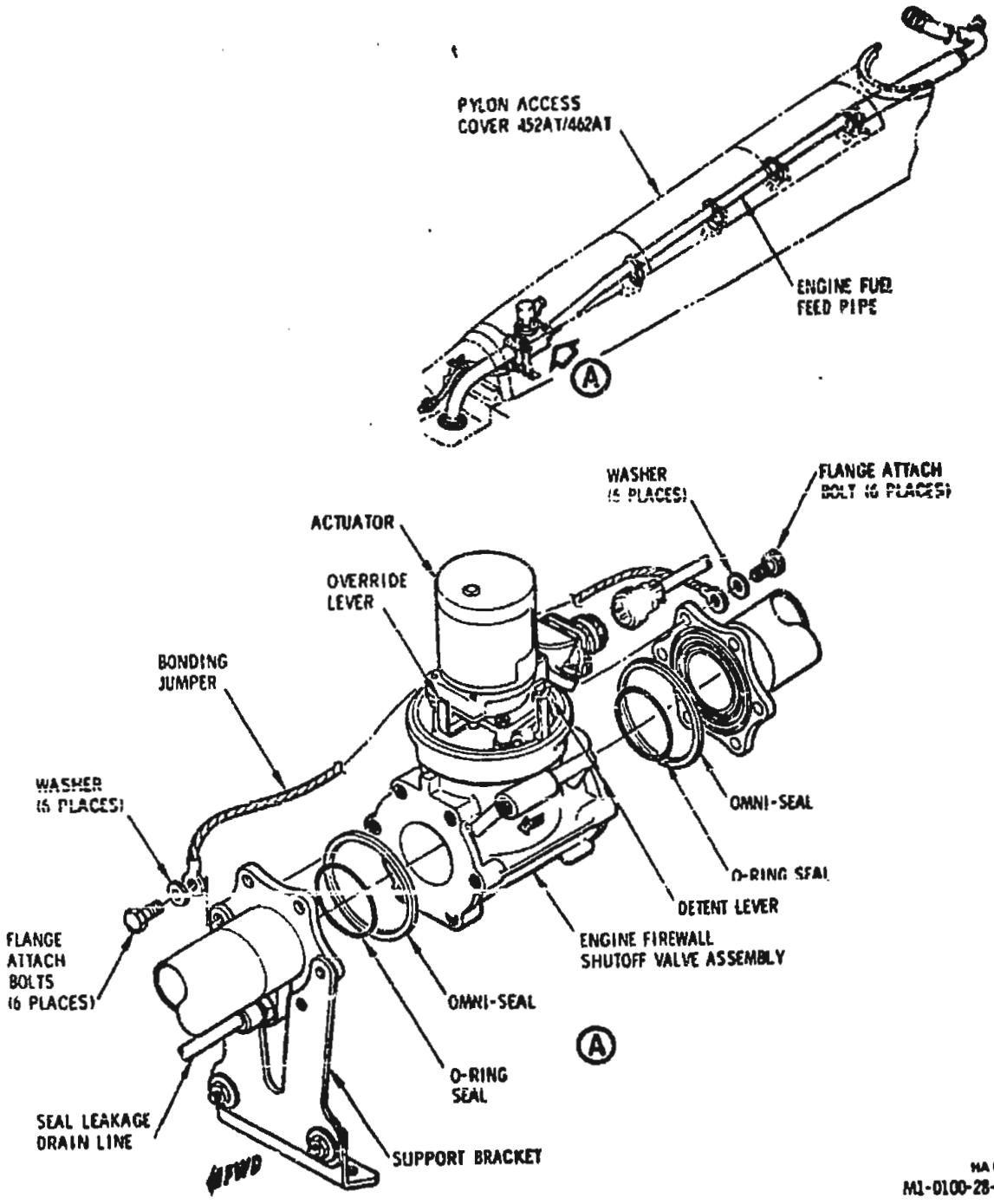
B. Installation

(1) Verify that circuit breakers opened in Step 3A(2) are open and tagged.

(2) Using clean rags and cleaner, clean all cured sealing compound from fuel inlet and outlet pipe flanges and lugs of bonding jumper.

(3) Install new omni-seals and O-ring seals in pipe assembly flanges (Ref. Fig. 401).

(4) Lubricate seals and mating flanges of pipes with specified grease.



R No. 1 and 3 Engine Firewall Shutoff Valve
R Removal and Installation
R Figure 401

EFFECTIVITY: ALL

050B

(5) Carefully slip firewall shutoff valve housing between pipe assembly flanges, taking care not to dislodge seals. Be certain embossed arrow on side of valve housing is facing forward, toward the engine.

(6) Using new bolts and washers coated with wet sealing compound, attach inlet and outlet fuel pipe flanges to valve housing. Install bonding jumper under bolt heads (across valve housing).

(7) Attach electrical connector.

(8) Allow sealant applied in Step 3B(6) to cure for 24 hours at 75(±10) degrees F (minimum).

(9) Remove tags and close circuit breakers opened in Step 3A(2).

(10) Open tank valve closed in Step 3A(1).

(11) Check operation of firewall shutoff valve (Ref. 28-24-07).

FIREWALL SHUTOFF VALVE, ENGINE NO. 1 AND 3 ADJUSTMENT AND TEST

1. Referenced Procedure

   24-00-00 Electrical Power System - Maintenance Practices

2. Adjustment/Test

   A. Operational Check

      (1) Apply external electrical power (Ref. 24-00-00).

      (2) At Flight Engineer/Second Officers FUEL SYSTEM panel, zone 215, verify that ENG 1 and ENG 3 tank valve switchlights are latched in (flowbar lights on and blue valve-in-transit lights are out).

      (3) Verify that ENG 1 and ENG 3 EMERGENCY SHUTOFF lights are out.

      CAUTION: DO NOT ACTUATE FIRE BOTTLE DISCHARGE SWITCH WHICH IS EXPOSED WHEN FIRE PULL HANDLE IS PULLED.

      (4) Pull applicable NO. 1 or NO. 3 FIRE PULL handle on the pilots overhead panel. Verify the following results:

         (a) Applicable ENG 1 or ENG 3 tank valve closes (flowbar light out; blue valve-in-transit light on, then out).

         (b) Engine firewall shutoff valve closes (EMERGENCY SHUTOFF light on, then out).

      (5) Push in FIRE PULL handle and verify the following results:

         (a) Applicable ENG 1 or ENG 3 TANK VALVE opens (flowbar light on; blue valve-in-transit light on, then out).

         (b) Engine firewall shutoff valve opens (EMERGENCY SHUTOFF light on, then out).

      (6) Turn off external electrical power. With battery switch on FE/SO electrical panel in OFF position, and battery connected to the battery bus, pull applicable ENG 1 or ENG 3 FIRE PULL handle and verify that ENG 1

R or ENG 3 tank valve closes (flowbar light out; blue
R valve-in-transit light on, then out).

R (7) Push FIRE PULL handle in. Verify that there is no
R indicated change in tank valve or firewall shutoff
R valve position.

R (8) Reapply external electrical power and verify that the
R closed tank valve opens (flowbar light on, blue light
R on, then out).

R (9) Turn off external electrical power.

CR FIREWALL SHUTOFF VALVE PLUG-IN ASSEMBLY, ENGINES NO. 1 AND 3
CR MAINTENANCE PRACTICES

CR 1. Conversion of -3 and -4 Actuators

CR A. If it is required to change the firewall shutoff valve assembly and it has a -3 actuator installed on it, it is possible to convert it to a -4 actuator in the field by accomplishing the following:

CR (1) At a shop bench, remove the two screws in the base of the cannon plug conduit.

CR (2) Carefully rotate the conduit assembly into the horizontal position. Being very careful not to add a twist to the wires. There is a relay in this conduit which makes for a very tight fit.

CR (3) Check the conduit o-ring for correct position.

CR (4) Carefully reinstall screws.

CR NOTE: This unit is vacuum tested in the shop so that the careful installation of this o-ring is very important.

FIREWALL SHUTOFF VALVE PLUG-IN ASSEMBLY, ENGINES NO. 1 AND 3 REMOVAL AND INSTALLATION

1. General

Engine No. 1 and 3 firewall shutoff valves have a housing containing a rotary sleeve secondary shutoff valve, an electrical actuator, and a plug-type primary shutoff valve. The actuator and primary shutoff valve may be replaced as an integral plug-in assembly. Rotation of the plug-in assembly, during removal, actuates the secondary shutoff valve to a position which shuts off the housing fuel inlet and outlet ports.

2. Equipment and Materials

R Preformed Packing (Ref. Fig. 401)

Grease, Fluorosilicone, Dow Corning FS 1291, or equivalent

3. Referenced Procedures

6-40-00	Exterior Access Doors and Panels
24-00-00	Electrical Power System - Maintenance Practices
28-24-07	Firewall Shutoff Valve, Engine No. 1 and 3 - Adjustment and Test

4. Removal/Installation

R CAUTION: VALVE ASSEMBLIES MODIFIED BY SB28-062 HAVE A GOLD
R ANODIZED SPACER PLATE ATTACHED TO THE VALVE ROTOR
R COVER ASSY THAT SUPPORTS THE ACTUATOR. THE PLATE
R PREVENTS INWARD MOVEMENT OF TWO VALVE RETAINING PINS
R INSTALLED IN THE COVER AND IS REQUIRED ONLY ON UNITS
R HAVING A RED ANODIZED COVER ASSY. WHEN REPLACING A
R PLUG-IN UNIT HAVING A RED ANODIZED COVER, BE SURE THAT
R THE REPLACEMENT UNIT IS EQUIPPED WITH THE SPACER
R PLATE.

R PLUG-IN UNITS HAVING A GOLD ANODIZED COVER ASSY HAVE
R STEPPED VALVE RETAINING PINS AND DO NOT REQUIRE THE
R SPACER PLATE.

A. Removal

(1) Apply external electrical power (Ref. 24-00-00). If external electrical power is not available, proceed with Step 3.

(2) On Flight Engineer/Second Officers FUEL SYSTEM panel, zone 215, depress (unlatch) applicable ENG 1 or ENG 2 TANK VALVE switchlight. Verify that tank valve closes (flowbar light out, blue valve-in-transit light on, then out).

(3) Open wing leading edge access door 511LB or 611LB (Ref. 6-40-00) and manually actuate tank valve override lever to the CLOSED position.

(4) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag the following circuit breakers:

ENG 1 - TANK VALVE or ENG 3 - TANK VALVE (T6 or T12)

ENG NO. 1 - EMER & L XFEED or ENG 3 - EMER & R XFEED (T7 or T13)

INBD BOOST PUMP - TANK 1 or 3 (U1 or U10)

OUTBD BOOST PUMP 1 or 3 (U13 or U14)

(5) Remove pylon access cover 452AT or 462AT (Ref. 6-40-00).

(6) Disconnect electrical harness at valve actuator (Ref. Fig. 401).

(7) Depress detent lever and rotate plug-in assembly 90 degrees counterclockwise.

(8) Withdraw plug-in assembly from valve housing.

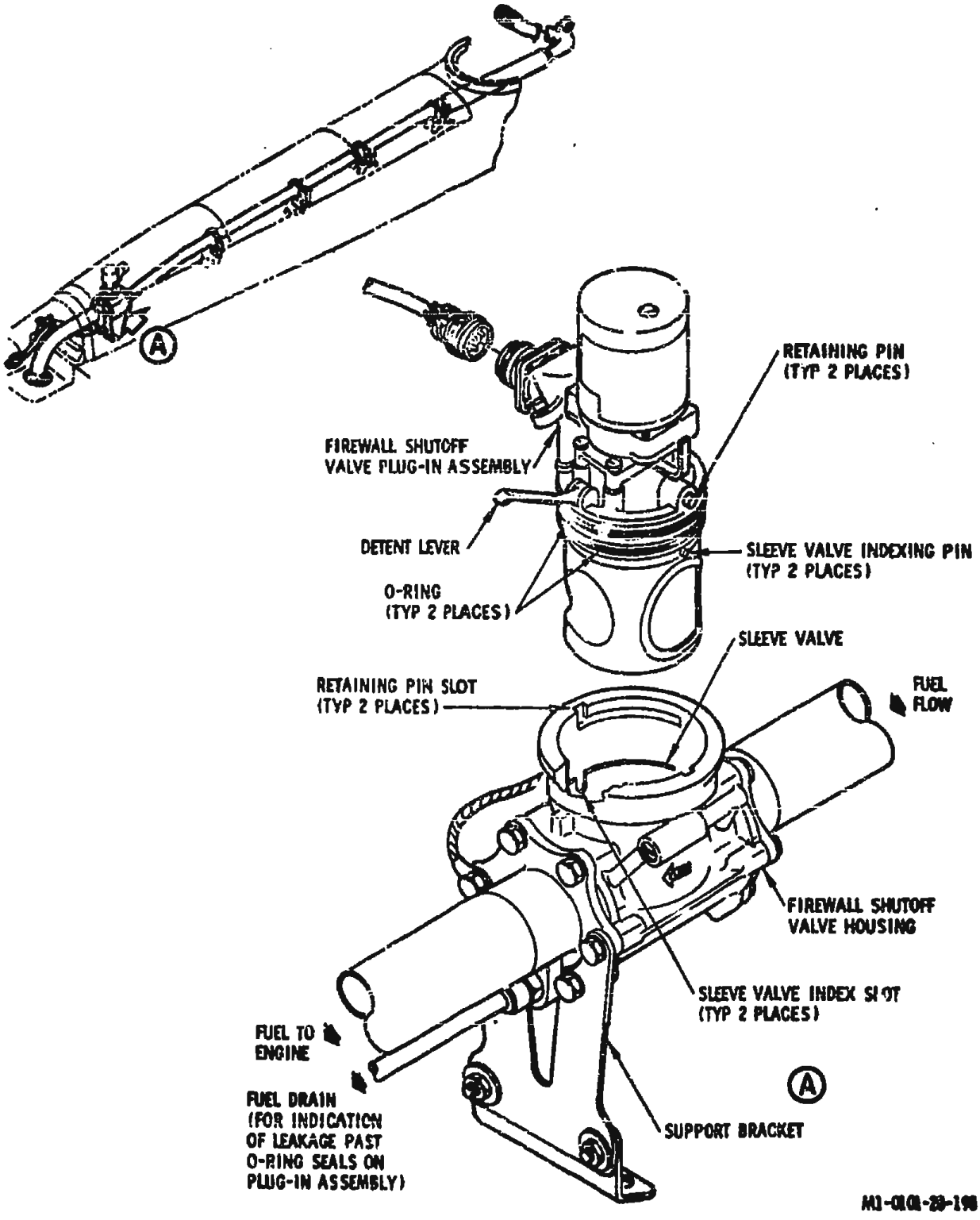
B. Installation

R (1) Verify that the circuit breakers opened in Step 4A(4) are opened and tagged.

(2) Verify that the plug-in assembly override lever is in the CLOSED position.

(3) Install new preformed packing and lubricate with grease (Ref. Para. 2).

R (4) Align retaining pins with slots in valve body.



R No. 1 and 3 Engine Firewall Shutoff Valve Plug-in Assemblies
R Removal and Installation
R Figure 401

(5) Push plug-in assembly into valve housing until it bottoms, then rotate 90 degrees clockwise. Verify detent lever is engaged in retaining slot.

(6) Connect electrical harness plug and add lockwire.

R (7) Manually open tank valve and close access door opened
R in Step 4A(3).

R (8) Remove tags and close circuit breakers opened in Step
R 4A(4).

R (9) Apply external electrical power (Ref. 24-00-00).

(10) Turn on applicable fuel feed boost pumps and check operation of firewall shutoff valve while installation is visually checked for fuel leakage (Ref. 28-24-07).

(11) Install pylon access cover (Ref. 6-40-00).

FIREWALL SHUTOFF VALVE ACTUATOR, ENGINES NO. 1 AND 3 REMOVAL AND INSTALLATION

1. Referenced Procedures

	6-40-00	Exterior Access Doors and Panels
R R	28-24-07	Firewall Shutoff Valve, Engine No. 1 and 3 - Adjustment and Test

2. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag applicable circuit breaker ENG 1 - EMER & L XFEED or ENG 3 - EMER & R XFEED.

(2) Remove pylon access cover 452A1 or 462AT (Ref. 6-40-00).

(3) Disconnect firewall shutoff valve electrical connector.

(4) Remove actuator attach screws and separate actuator from valve.

B. Installation

(1) Verify that circuit breaker opened in Step 2A(1) is open and tagged.

(2) Engage actuator drive shaft to adapter in valve and install actuator attach screws.

(3) Connect electrical connector.

R R (4) Verify that actuator override lever is in OPEN position.

R R (5) Remove tag and close circuit breakers opened in Step 2A(1).

R R (6) Check operation of firewall shutoff valve (Ref. 28-24-07).

R (7) Install pylon access cover (Ref. 6-40-00).

R FIREWALL SHUTOFF VALVE, ENGINE NO. 2
R REMOVAL AND INSTALLATION

R 1. General

R Engine No. 2 primary and secondary firewall shutoff valves are
R connected in series along the No. 2 engine fuel feed line. The
R valves are located on the left side of the afterbody area, above
R the horizontal stabilizer. This procedure applies to either the
R primary or secondary firewall shutoff valve.

R 2. Equipment and Materials

R Container (approved for fuel storage and transit)

R Control Column Lock, PN BA80, or equivalent

R Grease, Flourosilicone, Dow Corning FS 1291, or equivalent

R Preformed packing

R 3. Referenced Procedures

R	6-40-00	Exterior Access Doors and Panels - Description and Operation
R	24-41-00	Electrical Power/Ground Service System - Maintenance Practices
R	28-24-10	Firewall Shutoff Valve, Engine No.2 - Adjustment and Test
R	28-20-01	WIG-O-FLEX Couplings - Maintenance Practices
R	29-00-00	Hydraulic Power System - Maintenance Practices

R 4. Removal/Installation

R A. Removal

R (1) Close engine No. 2 tank valve by performing Step (a) or
R (b).

R (a) In hydraulic service center, zone 147, manually
R actuate engine No. 2 tank valve override lever to
R the CLOSED position.

R (b) Turn on electrical power (Ref. 24-41-00). On Flight Engineer/Second Officers FUEL SYSTEM panel, zone 215, actuate engine No. 2 tank valve switchlight to close the valve. Turn off electrical power (Ref. 24-41-00).

R (2) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag the following circuit breakers:

R ENG 2 SEC EMER CX FEED (T10)

R INBD BOOST PUMP TANK 2L & 2R (U8, U9)

R On aircraft 001-031,
R OUTBD BOOST PUMP 2L & 2R (U5, U6)

R On aircraft 032-999,
R OUTBD BOOST PUMP 2L & 2R (U3, U4)

R ENG 2 - TANK VALVE (T9)

R ENG 2 PRI EMER (R18)

R (3) On Pilots overhead circuit breaker panel CB1, zone 210, R open and tag the following circuit breakers:

R FUEL VALVE PRI EMER 2 (D14)

R (4) Shut off all four hydraulic systems (Ref. 29-11-00).

R (5) Attach warning tags to Flight Engineer/Second Officers R HYDRAULIC SYSTEM panel, zone 215, and HYDRAULIC SERVICE R panel, zone 147.

R (6) Install control column lock.

R (7) Gain access to afterbody above horizontal stabilizer R through access door 317 BB (Ref. 6-40-00).

R (8) Locate firewall shutoff valves on left side of R afterbody area.

R (9) Verify firewall shutoff valve to be removed is in open R position and other firewall shutoff valve is in closed R position. If valve position is not as desired, R manually actuate shutoff valve override lever to R appropriate position.

R (10) Remove drain plug from WIG-O-FLEX couplings on both R sides of firewall shutoff valve to be removed and allow R fuel to drain into container (Ref. Fig. 401).

R (11) Replace drain plug.

R (12) Disconnect firewall shutoff valve electrical connector.

R (13) Remove bonding jumper.

R (14) Support firewall shutoff valve and disassemble
R WIG-O-FLEX couplings on each side of valve (Ref.
R 28-20-01).

R (15) Remove firewall shutoff valve from aircraft.

R B. Installation

R (1) Verify Steps 4.A.(1) through 4.A.(6) have been
R accomplished.

R (2) Install new preformed packing on valve body flange and
R lubricate with grease.

R (3) Position firewall shutoff valve between fuel inlet and
R outlet hoses. Ensure that embossed arrow on side of
R valve housing is facing aft, toward engine No. 2.

R (4) Reconnect fuel lines to firewall shutoff valve by
R reassembling WIG-O-FLEX couplings (Ref. 28-20-01).

R (5) Reconnect bonding jumper.

R (6) Connect electrical connector.

R (7) Manually open primary and secondary firewall shutoff
R valves.

R (8) Remove tags and close circuit breakers opened in steps
R 4.A.(2) and 4.A.(3).

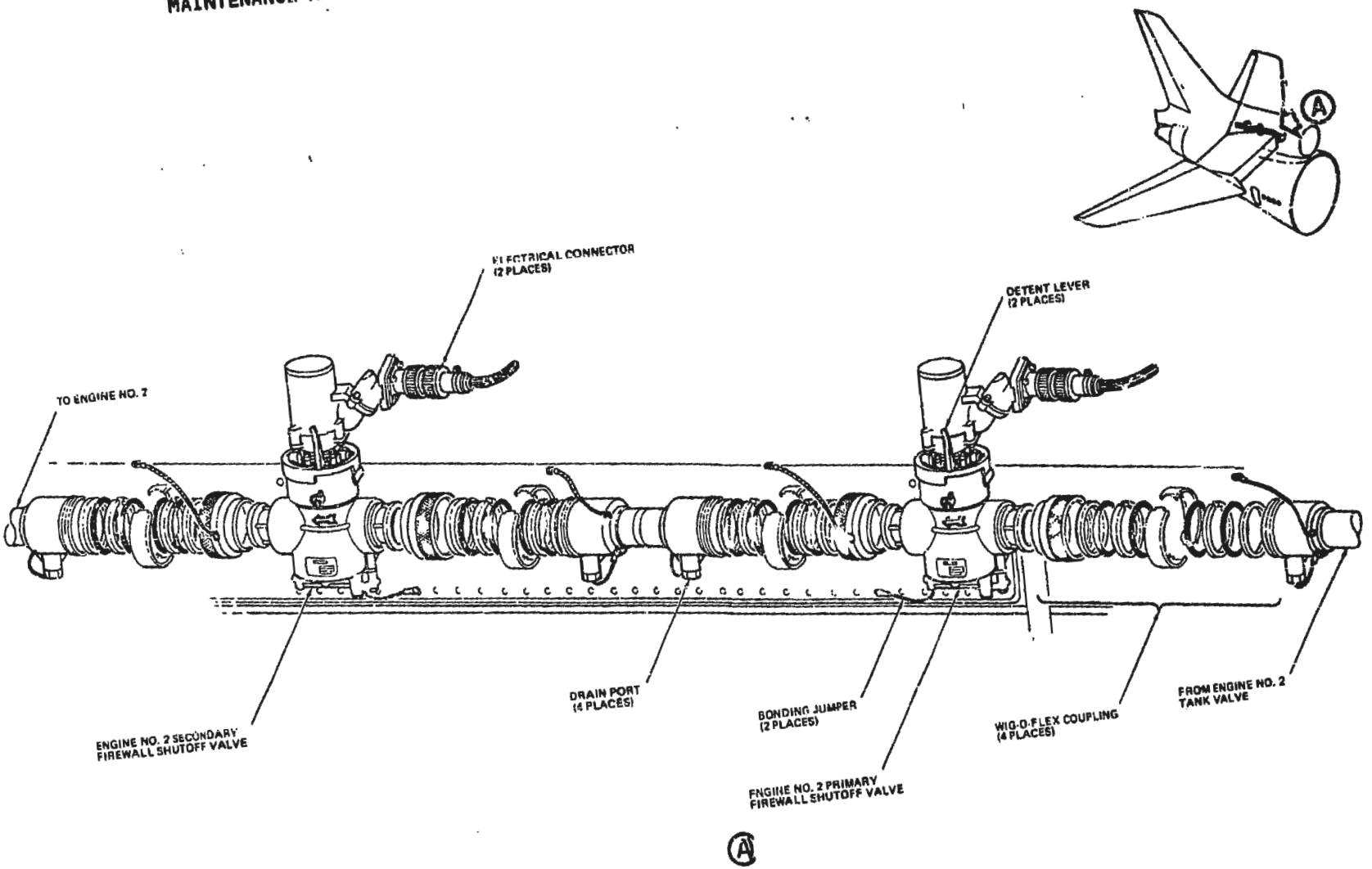
R (9) Open engine No. 2 tank valve.

R (10) Perform operational test of firewall shutoff valve
R while installation is visually checked for fuel leakage
R (Ref. 28-24-10).

R (11) Close access door 317 BB (Ref. 6-40-00).

R (12) Remove control column lock.

R (13) Remove tags installed in Step 4.A.(5).



Firewall Shutoff Valve - Engine No. 2
Removal and Installation
Figure 401

R
R
R

EFFECTIVITY: ALL

FIREWALL SHUTOFF VALVE, ENGINE NO. 2 - ADJUSTMENT AND TEST

1. Referenced Procedure

   24-00-00 Electrical Power System - Maintenance Practices

2. Adjustment/Test

   A. Operational Test

      (1) Apply external electrical power (Ref. 24-00-00).

R   (2) Verify ENG 2 primary EMERGENCY SHUTOFF light on FE/SO
R   FUEL SYSTEM panel is off.

R   (3) Verify ENG 2 secondary EMERGENCY SHUTOFF light on FE/SO
R   FUEL SYSTEM panel is off.

      CAUTION: DO NOT ACTUATE FIRE BOTTLE DISCHARGE SWITCH WHICH IS EXPOSED WHEN FIRE PULL HANDLE IS PULLED.

      (4) Pull ENG 2 FIRE PULL handle on pilots overhead panel.
R   Verify ENG 2 primary and secondary shutoff valves close
R   (both primary and secondary EMERGENCY SHUTOFF lights on
R   FUEL SYSTEM panel come on, then go off).

R   (5) Push in ENG 2 FIRE PULL handle. Verify both ENG 2
R   primary and secondary shutoff valves open (both primary
R   and secondary EMERGENCY SHUTOFF lights come on, then go
R   off).

      (6) Turn off external electrical power. With battery switch on FE/SO ELECTRICAL panel in OFF position, and battery connected to the battery bus, pull ENG 2 FIRE
R   PULL handle and verify ENG 2 primary shutoff valve
R   closes (primary EMERGENCY SHUTOFF light comes on, then
R   goes off).

R   (7) Push in FIRE PULL handle. Verify there is no indicated
R   change in firewall shutoff valve positions (EMERGENCY
R   SHUTOFF lights do not come on).

R   (8) Reapply external electrical power. Verify ENG 2
R   primary shutoff valve opens (primary EMERGENCY SHUTOFF
R   light comes on, then goes off).

      (9) Turn off external electrical power.

FIREWALL SHUTOFF VALVE PLUG-IN ASSEMBLY, ENGINE NO. 2 REMOVAL AND INSTALLATION

1. General

Engine No. 2 primary and secondary firewall shutoff valves have a housing containing a manually operated rotary sleeve valve and a plug-type valve operated by an electrically powered actuator. The actuator and plug valve may be replaced as an integral plug-in assembly. Rotation of the plug-in assembly, during removal, mechanically actuates the sleeve valve to a position which shuts off the housing fuel inlet and outlet ports. The following removal and installation procedures apply to plug-in assemblies installed in both primary and secondary firewall shutoff valves.

2. Equipment and Materials

Grease, Fluorosilicone, Dow Corning FS 1291, or equivalent

Preformed packing (Ref. Fig. 401)

Control Column Lock, PN BA80, or equivalent

3. Referenced Procedures

6-40-00	Exterior Access Doors and Panels
28-24-07	Firewall Shutoff Valve, Engine No. 2 - Adjustment and Test
29-11-00	Hydraulic Power System - Maintenance Practices

4. Removal/Installation

CAUTION: VALVE ASSEMBLIES MODIFIED BY SB28-062 HAVE A GOLD
R ANODIZED SPACER PLATE ATTACHED TO VALVE ROTOR COVER
R ASSY THAT SUPPORTS ACTUATOR. PLATE PREVENTS INWARD
R MOVEMENT OF TWO VALVE RETAINING PINS INSTALLED IN
R COVER AND IS REQUIRED ONLY ON UNITS HAVING A RED
R ANODIZED COVER ASSY. WHEN REPLACING A PLUG-IN UNIT
R HAVING A RED ANODIZED COVER, BE SURE THAT REPLACEMENT
R UNIT IS EQUIPPED WITH SPACER PLATE.

R PLUG-IN UNITS HAVING A GOLD ANODIZED COVER ASSY HAVE
R STEPPED VALVE RETAINING PINS AND DO NOT REQUIRE SPACER
R PLATE.

A. Removal

(1) On pilots overhead circuit breaker panel CB1, zone 210, open and tag circuit breaker FUEL SHUTOFF VALVE - PRI EMER 2 (D14).

R (2) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag the following circuit breakers:

APU BAT BUS - TANK VALVE & PUMP (S14)

ENG 2 TANK VALVE (T9)

ENG 2 - SEC EMER CX FEED (T10)

ENG 2 PRI EMER (R18)

R (3) In hydraulic service center compartment, zone 147, manually close APU and engine No. 2 tank valves.

R (4) Shut off all four hydraulic systems (Ref. 29-11-00).

R (5) Attach warning tags to Flight Engineer/Second Officers HYDRAULIC SYSTEM panel, zone 215, and HYDRAULIC SERVICE PANEL, zone 147.

R (6) Install control column lock.

R (7) Gain access to afterbody area above horizontal stabilizer through access door 317BB (Ref. 6-40-00). Locate firewall shutoff valves on left side of afterbody area.

R (8) Disconnect electrical connector (Ref. Fig. 401).

R (9) Depress detent lever and rotate plug-in assembly 90 degrees counterclockwise. Withdraw plug-in assembly from valve housing.

B. Installation

R (1) Verify that circuit breakers opened in Step 4A(1) and
R (2) are open and tagged.

R (2) Verify that Steps 4A(4) through (6) are complied with before re-entering afterbody area.

(3) Install new preformed packing on plug-in assembly valve and lubricate with grease (Ref. Para. 2).

(4) Push plug-in assembly into valve body, then rotate 90 degrees clockwise. Verify detent lever is engaged in retaining slot.

(5) Align retaining pin with slots in valve body.

(6) Push plug-in assembly into valve body, then rotate 90 degrees clockwise. Verify detent lever is engaged in retaining slot.

(7) Connect electrical connector.

R (8) Remove tags and close circuit breakers opened in Steps 4A(1) and (2).

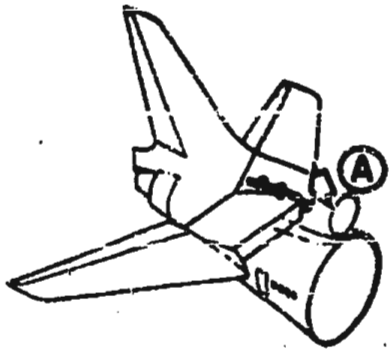
(9) In hydraulic service compartment, zone 147, manually open APU and engine No. 2 tank valves.

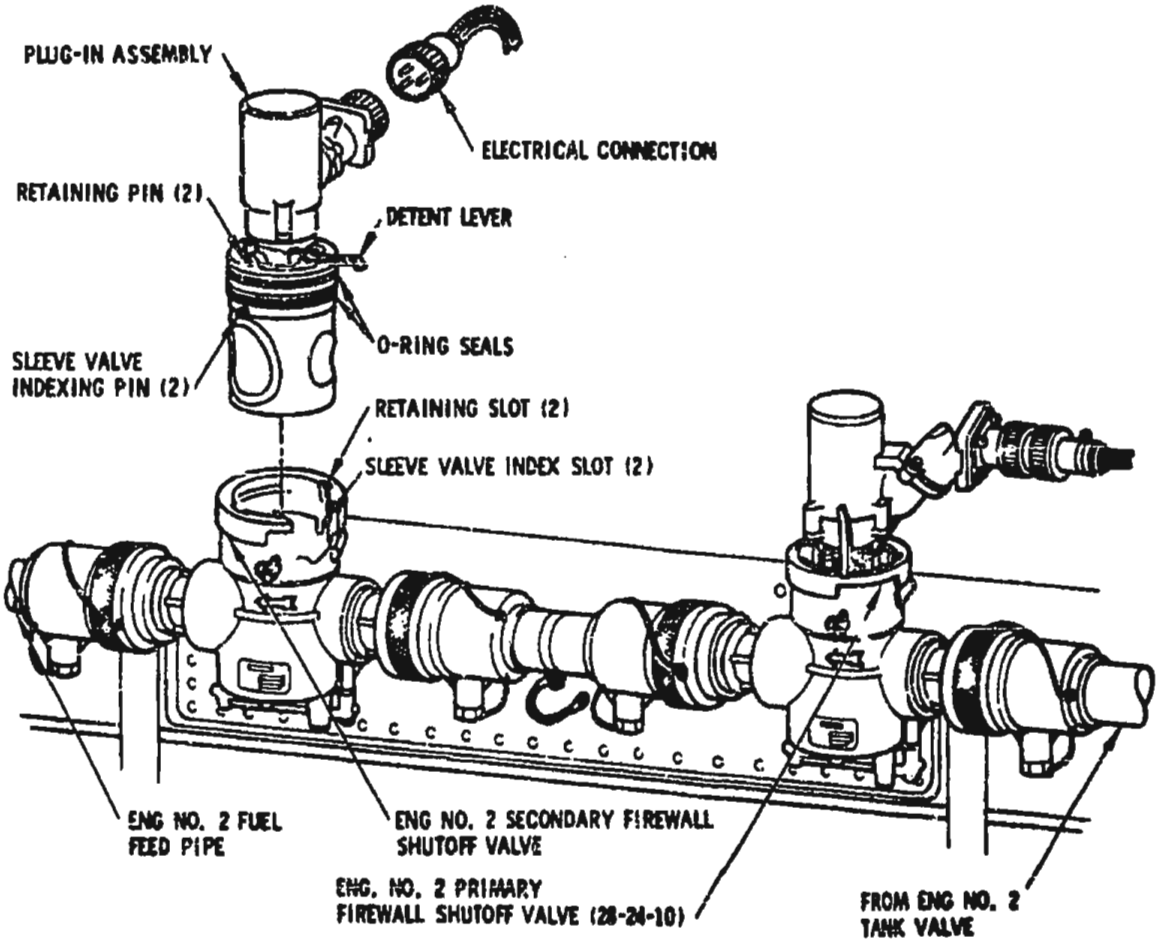
(10) Functionally check operation of firewall shutoff valve while installation is visually checked for fuel leakage (Ref. 28-24-00).

(11) Close access door 317 BB (Ref. 6-40-00).

(12) Remove control column lock.

R (13) Remove tags installed in Step 4A(5).




PLUG-IN ASSEMBLY
ELECTRICAL CONNECTION
RETAINING PIN (2)
DETENT LEVER
O-RING SEALS
SLEEVE VALVE INDEXING PIN (2)
RETAINING SLOT (2)
SLEEVE VALVE INDEX SLOT (2)
ENG NO. 2 FUEL FEED PIPE
ENG NO. 2 SECONDARY FIREWALL SHUTOFF VALVE
ENG. NO. 2 PRIMARY FIREWALL SHUTOFF VALVE (28-24-10)
FROM ENG NO. 2 TANK VALVE
A

M1-0101-28-20B

R Engine No. 2 Firewall Shutoff Valve Plug-in Assembly
R Removal and Installation
R Figure 401

EFFECTIVITY: ALL

0018

FUEL FLOW EQUALIZER - MAINTENANCE PRACTICES

1. General

The following procedure is to be performed if aircraft is to be dispatched with the equalizer inoperative.

2. Deactivation

NOTE: This deactivation procedure applies only when an aircraft is to be dispatched in accordance with the MEL.

A. Fuel Flow Equalizer

CR NOTE: Inoperative equalizer rotor is indicated by the bar in rotor shaft view window not rotating when the No. 2 engine or APU is operating. Ability to manage engine No. 2 fuel feed supply from both 2L and 2R tanks verifies equalizer bypass mode is operative.

(1) Install FUEL FLOW EQUALIZER INOPERATIVE placard on Flight Engineer/Second Officers FUEL SYSTEM panel.

(2) Make appropriate entry in aircraft log book.

CR 3. Operational Check

CR A. Fuel Flow Equalizer

CR (1) With No. 2 engine or APU running, check for rotation of the equalizer rotors thru the sight glass on the left side of the equalizer by observing rotor shaft rotation.

CR NOTE: There is normally a bar embossed in the end of the rotor shaft to aid in observing shaft rotation.

CR (2) If the rotor shaft is observed as rotating smoothly, the fuel flow equalizer is operating normally. If no rotation is observed, the equalizer is inoperative.

FUEL FLOW EQUALIZER - REMOVAL AND INSTALLATION

1. Equipment Materials

Container (approved for fuel storage and transit)

O-ring seals (Ref. Fig. 401)

Grease, Fluorosilicone, Dow Corning FS 1291, or equivalent

Lock-wire, Fed Spec QQ-W-390, 0.032-inch diameter, or equivalent

2. Referenced Procedures

24-41-00	External Power/Ground Service System - Maintenance Practices
28-24-00	Engine Feed System - Adjustment and Test

3. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag the following circuit breakers:

ENG 1 - EMER & LX FEED (T7)

ENG 2 - TANK VALVE (T9)

ENG 2 - SEC EMER CX FEED (T10)

ENG 3 - EMER & RX FEED (T13)

R R OUTBD BOOST PUMP - TANK 2L and 2R (U3 and U4) or (U5 and U6)

INBD BOOST PUMP - TANK 1, 2L, 2R, and 3 (U7 thru U10)

R OUTBD BOOST PUMP - TANK 1 and 3 (U13 and U14)

R R R R R (2) In the hydraulic service center compartment, zone 147, manually close the three fuel crossfeed valves, the engine No. 2 tank valve, and the two manual shutoff valves at the inlet ports to the fuel flow equalizer (Ref. Fig. 401).

(3) Lock-wire and tag the manual shutoff valve linkage in the valve-closed position to assure that valves will not be inadvertantly opened while fuel flow equalizer is removed.

(4) Remove two drain plugs and drain fuel from fuel flow equalizer into container. Reinstall drain plugs.

(5) Remove equalizer flange attach bolts, washers, and nuts to separate equalizer from the manual shutoff valves and fuel outlet connector.

B. Installation

(1) Verify that circuit breakers opened in Step 3A(1) are open and tagged.

(2) Install new O-ring seals lubricated with grease, and hold fuel flow equalizer in installed position (Ref. Fig. 401). Install flange attach bolts, washers, and nuts. Install lock-wire between bolt heads.

(3) Remove lock-wire and tag installed in Step 3A(3) and open manual shutoff valves. Lock-wire linkage in valve-open position.

(4) Manually open the remaining fuel control valves closed in Step 3A(2).

(5) Remove tags and close circuit breakers opened in Step 3A(1).

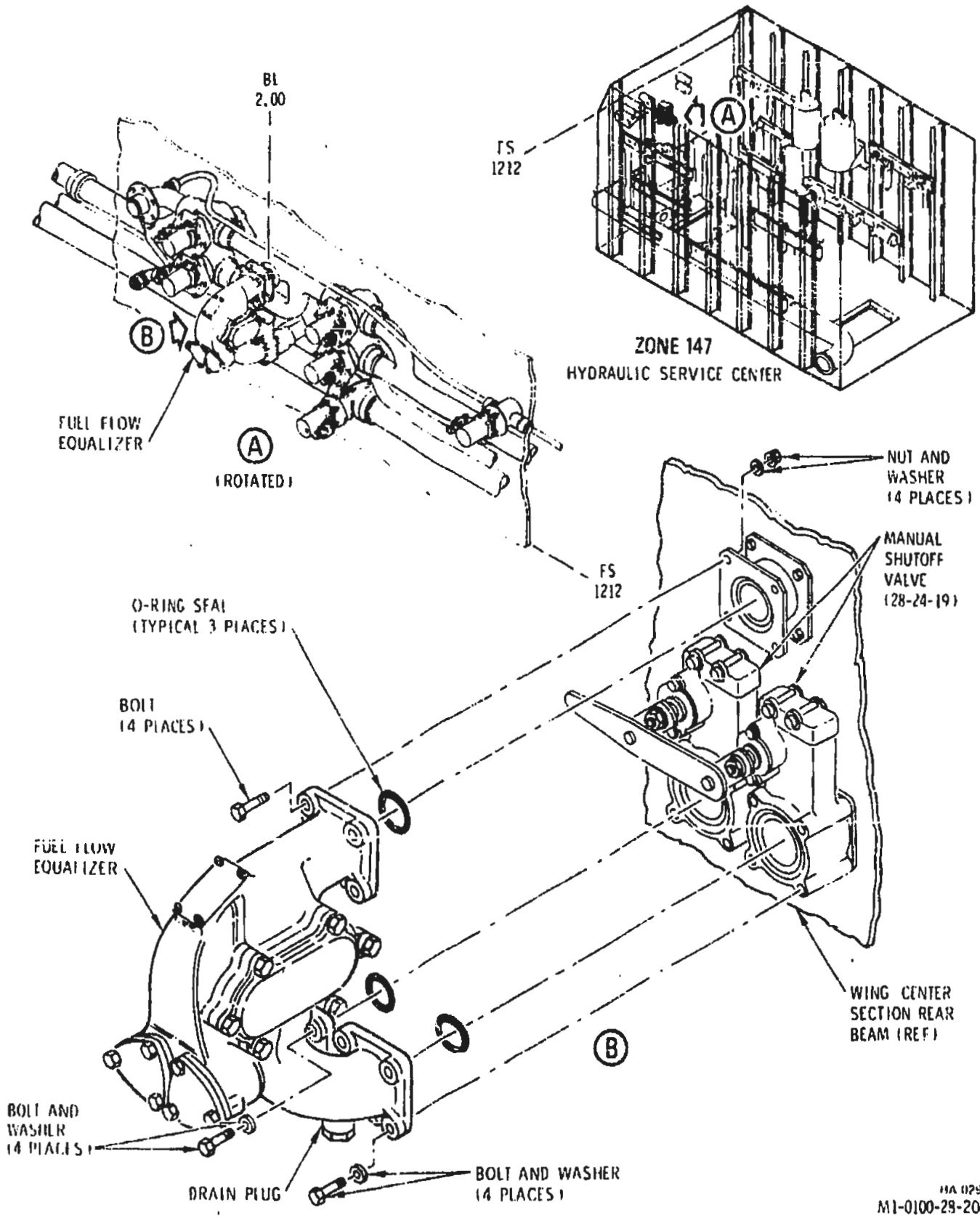
(6) Turn on electrical power (Ref. 24-41-00).

(7) At Flight Engineer/Second Officers FUEL SYSTEM panel, zone 215, electrically close engine No. 2 tank valve.

(8) Pressurize engine No. 2 fuel feed system and visually inspect fuel flow equalizer installation for signs of fuel leakage (Ref. 28-24-00).

(9) Turn off electrical power (Ref. 24-41-00).

CR (10) With the No. 2 engine or APU running, check for
CR rotation of the equalizer rotors through the sight
CR glass on the left side of the equalizer. If the rotor
CR shaft is observed as rotating smoothly, the equalizer
CR is operating normally. If no rotation is observed, the
CR equalizer is inoperative.



R
R

Fuel Flow Equalizer - Removal and Installation
Figure 401

ENGINE NO. 2 TANK VALVE HOUSING - REMOVAL AND INSTALLATION

R 1. Equipment and Materials

R Container (approved for fuel transit and storage)

R Lock-wire, Fed Spec QQ-W-390, 0.032-inch diamater, or equivalent

R Preformed packing

2. Referenced Procedures

6-40-00	Exterior Access Doors and Panels
6-50-00	Interior Access Doors and Removable Panels
28-11-00	Fuel Tanks - Maintenance Practices
28-20-01	WIG-O-FLEX Couplings - Maintenance Practices
28-24-00	Engine Fuel Feed System - Description and Operation
28-24-00	Engine Fuel Feed System - Adjustment and Test
28-24-15	Engines No. 1, 2, and 3 Tank Valve Plug-In Assembly - Removal and Installation
28-26-00	Crossfeed System - Description and Operation

3. Removal and Installation

WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF. 28-11-00).

A. Removal

(1) Gain access to hydraulic service center through access door 147AB (Ref. 6-40-00).

(2) Close the manual shutoff valves at the fuel flow equalizer (Ref. 28-24-00) and ensure the L and R crossfeed valves are closed (Ref. 28-26-00).

R (3) On FE/SO aft circuit breaker panel CB3, zone 215, open and tag the following circuit breakers:

R ENG 1 - EMER & LX FEED (T7)

R ENG 2 - SEC EMER CX FEED (T10)

R ENG 3 - EMER & RX FEED (T13)

R FUEL SYSTEM - INBD BOOST PUMP - 2L & 2R (U8, U9)

R On aircraft 001-024, 027,
R FUEL SYSTEM - OUTBD BOOST PUMP - 2L & 2R (U5, U6)

R On aircraft 025-026, 028-999,
R FUEL SYSTEM - OUTBD BOOST PUMP - 2L & 2R (U3, U4)

R ENG 2 TANK VALVE (T9)

R (4) On pilots overhead circuit breaker panel CB1, zone 210,
R open and tag circuit breaker FUEL VALVE TANK 2 (D11).

R (5) Placard FE/SO FUEL SYSTEM panel, zone 215, and right
R wing FUEL/DEFUEL panel, zone 621, to prevent use.

R (6) In hydraulic service center, zone 147, position
R container beneath No. 2 engine feed drain valve.

R (7) Open valve and allow fuel to drain, then close and cap
R valve.

R (8) Remove engine No. 2 tank valve plug-in assembly (Ref.
R 26-24-15).

R (9) Remove access panel 147AZ on wing center section aft
R beam (Ref. 6-50-00).

R (10) Set up air mover to ventilate center section aft dry
R bay area (Ref. 28-11-00).

R NOTE: Wear an approved respirator while in the dry bay
R and have a second man stand by in hydraulic
R service center.

R Have container ready to catch residual fuel in
R fuel lines.

R (11) Enter center section dry bay and disassemble WIG-O-FLEX
R couplings (Ref. 28-20-01) at engine No. 2 tank valve
R (Ref. Fig. 401).

R (12) Loosen nuts and disconnect elbow and packing from tank
R valve and thermal relief tube.

R (13) Have one man hold the valve body while the other
R removes the bolts, packings and washers.

R NOTE: Note positions of drain bolts for
R reinstallation.

R (14) Remove valve body.

R (15) Continue to ventilate area.

R B. Installation

R (1) Verify that air mover set up in Step 3.A.(10) is in
R place and operating.

R (2) Ensure circuit breakers opened and tagged in Steps
R 3.A.(3) and 3.A.(4) are open and tagged.

R (3) Ensure placards installed in Step 3.A.(5) are
R installed.

R NOTE: Wear an approved respirator while in the dry bay
R and have a second man stand by in the hydraulic
R service center.

R (4) Insert new preformed packing in valve body mounting
R surface (Ref. Fig. 401).

R (5) While man in dry bay holds valve body in its installed
R position, install four bolts and washers.

R (6) Install washers, new packings, and drain bolts in the
R locations noted in Step 3.A.(13).

R (7) Lock-wire all bolts.

R (8) Install elbow, new packing, nuts, and thermal relief
R tube.

R (9) Install WIG-O-FLEX couplings (Ref. 28-20-01).

R (10) Install tank valve plug-in assembly (Ref. 26-24-15).

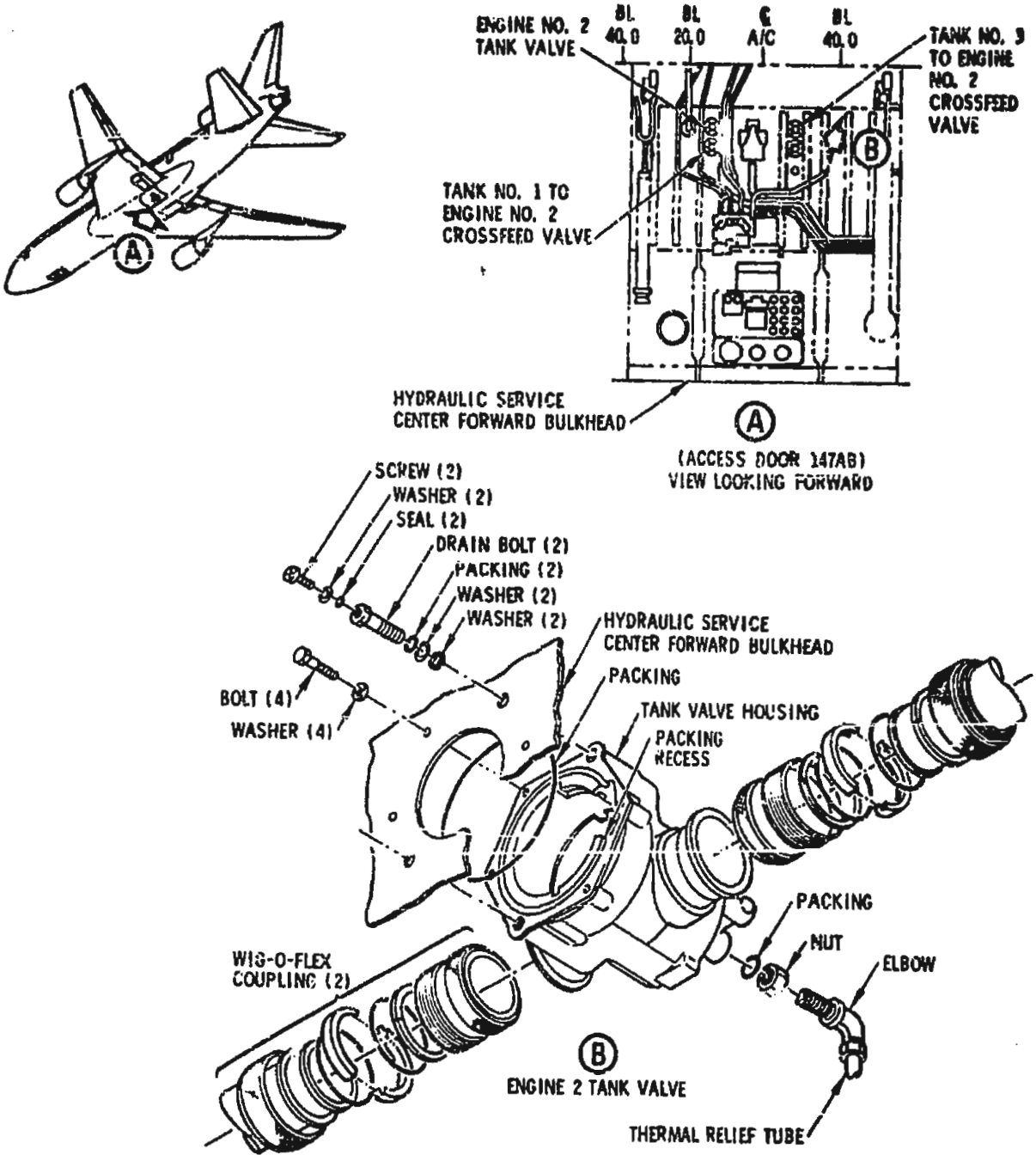
R (11) Remove tags and close circuit breakers opened in Steps
R 3.A.(3) and 3.A.(4).

R (12) Open valves closed in Step 3.A.(2).

R (13) Remove placards installed in Step 3.A.(5).

R (14) Perform operational checkout of tank valve and check
R for fuel leakage (Ref. 28-24-00).

R (15) Remove air moving equipment and close access doors
R opened in Steps 3.A.(1) and 3.A.(9).



M1-0000-28-1779

Engine No. 2 Tank Valve Housing
Removal and Installation
Figure 401

R EFFECTIVITY: ALL
R
001B

ENGINES NO. 1, 2, AND 3 TANK VALVE PLUG-IN ASSEMBLY REMOVAL AND INSTALLATION

1. General

The engine No. 1, 2, and 3 tank valves each have a housing containing a manually operated rotary sleeve valve and a butterfly-type valve operated by an electrically powered actuator. The actuator and butterfly valve may be replaced as an integral plug-in assembly. Rotation of the plug-in assembly, during removal, mechanically actuates the sleeve valve to a position which shuts off the housing fuel inlet and outlet ports. The engine No. 1 and 3 tank valves are mounted on the forward wing beam at inner wing station 455.00 in the fuel feed line. Plug-in assemblies for these valves are replaced from a position in the wing leading edge sections. The engine No. 2 tank valve is mounted on the wing center box section aft beam with the plug-in assembly accessible from the hydraulic service compartment, zone 147.

2. Equipment and Materials

Hand-held Container

R Preformed Packing (Ref. Fig. 401 and 402)

Grease, Fluorosilicone, Dow Corning FS 1291, or equivalent

3. Referenced Procedures

6-40-00	Exterior Access Doors and Panels
28-24-00	Fuel Feed System - Adjustment and Test

4. Removal/Installation

R CAUTION: VALVE ASSEMBLIES MODIFIED BY SB28-062 HAVE A GOLD
R ANODIZED SPACER PLATE ATTACHED TO THE VALVE ROTOR
R COVER ASSY THAT SUPPORTS THE ACTUATOR. THE PLATE
R PREVENTS INWARD MOVEMENT OF TWO VALVE RETAINING PINS
R INSTALLED IN THE COVER AND IS REQUIRED ONLY ON UNITS
R HAVING A RED ANODIZED COVER ASSY. WHEN REPLACING A
R PLUG-IN UNIT HAVING A RED ANODIZED COVER, BE SURE THAT
R THE REPLACEMENT UNIT IS EQUIPPED WITH THE SPACER
R PLATE.

R PLUG-IN UNITS HAVING A GOLD ANODIZED COVER ASSY HAVE
R STEPPED VALVE RETAINING PINS AND DO NOT REQUIRE THE
R SPACER PLATE.

A. Removal (Engine No. 1 or 3 Tank Valve Plug-in Assembly)

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag all engine fuel boost pump circuit breakers and circuit breaker ENG 1 - TANK VALVE or ENG 3 - TANK VALVE.

(2) Open wing leading edge access door 511LB or 611LB (Ref. 6-40-00).

(3) Disconnect electrical connector (Ref. Fig. 401).

(4) Depress detent lever and rotate plug-in assembly 90 degrees counterclockwise. Do not extract plug-in assembly from valve housing at this time.

(5) Remove drain fitting screw, and drain fuel trapped in valve housing into container. Reinstall drain screw.

(6) Withdraw plug-in assembly from valve housing.

B. Installation (Engine No. 1 or 3 Tank Valve Plug-in Assembly)

(1) Verify that circuit breakers opened in Step 4A(1) are open and tagged.

(2) Verify that the plug-in assembly being installed is equipped with a heat shield around the actuator and electrical receptacle.

R (3) Install preformed packing on valve. Lubricate seals
R with grease (Ref. Para. 2).

(4) Align retaining pins with slots in valve body (Ref. Fig. 401).

(5) Push plug-in assembly into valve body until it bottoms.

(6) Rotate plug-in assembly 90 degrees clockwise. Verify detent lever engages retaining slot in valve body.

(7) Connect electrical connector.

(8) Remove tags and close circuit breakers opened in Step 4A(1).

(9) Perform operational checkout of tank valve and check for fuel leakage (Ref. 28-24-00).

(10) Close access door 511LB or 611LB (Ref. 6-40-00).

C. Removal (Engine No. 2 Tank Valve Plug-in Assembly)

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag all engine fuel boost pump circuit breakers and circuit breaker ENG 2 - TANK VALVE.

(2) Enter hydraulic service center, zone 147, and locate engine No. 2 tank valve on aft beam wing center box section (Ref. Fig. 402).

(3) Disconnect electrical connector.

(4) Depress detent lever and rotate plug-in assembly 90 degrees counterclockwise. Do not extract plug-in assembly from valve housing at this time.

(5) Remove drain fitting screw and drain fuel trapped in valve housing into container. Reinstall drain screw.

(6) Withdraw plug-in assembly from valve housing.

D. Installation (Engine No. 2 Tank Valve Plug-in Assembly)

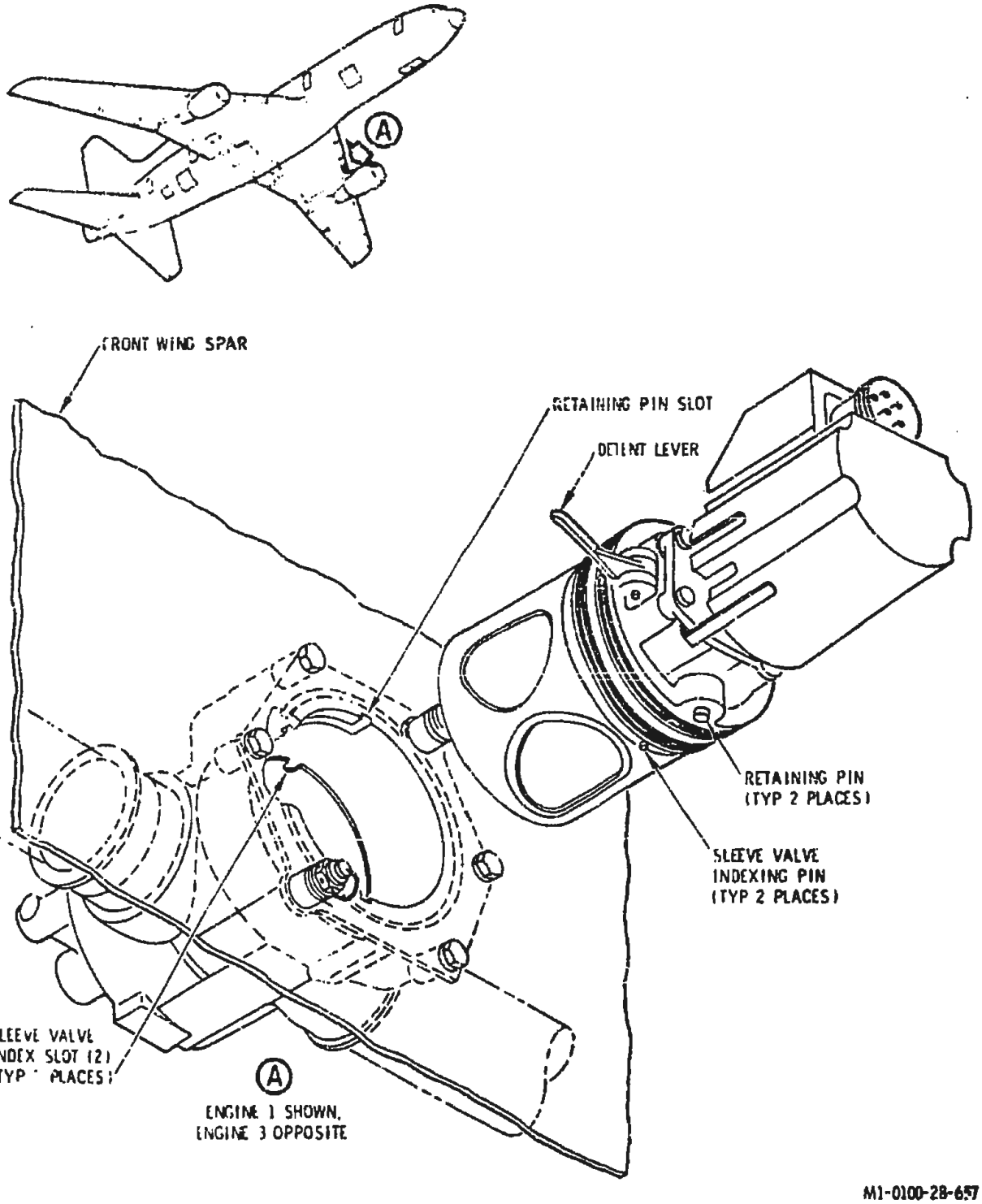
(1) Verify that circuit breakers opened in Step 4C(1) are open and tagged.

R (2) Install new preformed packing on plug-in valve.
R Lubricate seals with grease (Ref. Para. 2).

(3) Align retaining pins with slots in valve body (Ref. Fig. 402).

(4) Push plug-in assembly into valve body until it bottoms.

(5) Rotate plug-in assembly 90 degrees clockwise. Verify detent lever engages retaining slot in valve body.

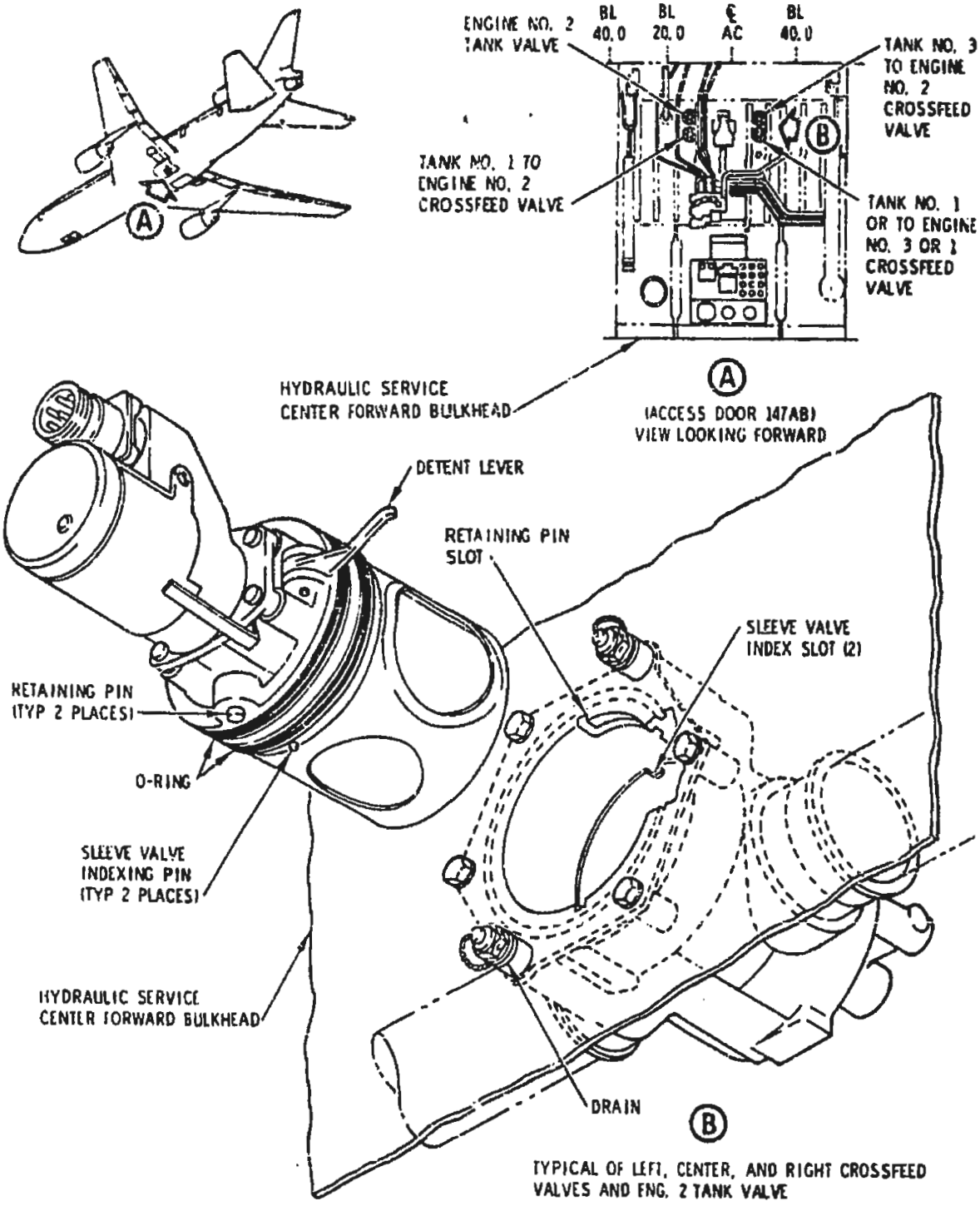


Engine 1 or 3 Tank Valve Plug-in Assembly - Removal and Installation
Figure 401

(6) Connect electrical connector.

(7) Remove tags and close circuit breakers opened in Step 4C(1).

(8) Perform operational checkout of tank valve and check for fuel leakage (Ref. 28-24-00).


ENGINE NO. 2 TANK VALVE
BL 40.0
BL 20.0
℄ AC
BL 40.0
TANK NO. 3 TO ENGINE NO. 2 CROSSFEED VALVE
TANK NO. 1 TO ENGINE NO. 2 CROSSFEED VALVE
TANK NO. 1 OR TO ENGINE NO. 3 OR 1 CROSSFEED VALVE
A
B
HYDRAULIC SERVICE CENTER FORWARD BULKHEAD
(ACCESS DOOR 147AB)
VIEW LOOKING FORWARD
DETENT LEVER
RETAINING PIN SLOT
SLEEVE VALVE INDEX SLOT (2)
RETAINING PIN (TYP 2 PLACES)
O-RING
SLEEVE VALVE INDEXING PIN (TYP 2 PLACES)
HYDRAULIC SERVICE CENTER FORWARD BULKHEAD
DRAIN
TYPICAL OF LEFT, CENTER, AND RIGHT CROSSFEED VALVES AND ENG. 2 TANK VALVE
M1-0100-28-656

Engine 2 Tank Valve Plug-in Assembly - Removal and Installation
Figure 402

R # CONTINUOUS SCAVENGE SYSTEM - MAINTENANCE PRACTICES

R 1. General

R The following procedure specifies tasks to be performed prior to
R dispatching an airplane with an inoperative fuel tank scavenge
R system.

R 2. Referenced Procedure

R	12-11-05	Tank Sump Drain Valves - Servicing
R	28-41-00	Fuel Quantity Indicating System - Adjustment and Test

R 3. Procedures

R NOTE: This deactivation procedure applies only when an aircraft
R is to be dispatched in accordance with the MEL.

R A. Drain the tank sump in the tank(s) with the inoperative
R continuous scavenge system at least once a day, reference
R Maintenance Manual 12-11-05.

R B. If tanks 2L and/or 2R system is inoperative confirm that all
R fuel quantity indicating systems are operational, reference
R Maintenance Manual 28-41-00, Adjustment and Test, Paragraph
R 4.A., Operational Test.

R C. Install placard in a prominent place on the FE/SO panel,
R CONTINUOUS SCAVENGE SYSTEM INOPERATIVE IN FUEL TANK(S).

R D. Make appropriate entry in the aircraft log book.

TANK NO. 2L AND 2R MANUAL SHUTOFF VALVES - REMOVAL AND INSTALLATION

1. General

To permit replacement of the fuel flow equalizer (Ref. 28-24-13) without defueling tanks No. 2L and 2R, a manually actuated shutoff valve is installed between each fuel feed manifold and fuel flow equalizer inlet port. The valve operating linkage is mechanically interconnected and normally lock-wired in the valve-open position.

2. Equipment and Materials

Container (approved for fuel storage and transit)

O-ring seals (for fuel flow equalizer and manual shutoff valve installations)

Grease, Fluorosilicone, Dow Corning FS 1291, or equivalent

Lock-wire, Fed Spec QQ-W-390, 0.032-inch diameter, or equivalent

3. Referenced Procedures

12-11-00	Fuel Tank Replenishing
24-00-00	Electrical Power System - Maintenance Practices
28-22-00	Defueling System - Maintenance Practices
28-24-00	Engine Feed System - Adjustment and Test
28-24-13	Fuel Flow Equalizer - Removal and Installation

4. Removal/Installation

A. Removal

(1) Defuel tank No. 2L or 2R (Ref. 28-22-00).

(2) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag the following circuit breakers:

ENG 1 - EMER & LX FEED (T7)

ENG 2 - SEC EMER CX FEED (T10)

ENG 2 - TANK VALVE (T9)

ENG 3 - EMER & RX FEED (T13)

OUTBD BOOST PUMP - 2L and 2R (U3 and U4) or (U5 and U6)

INBD BOOST PUMP - 2L and 2R (U8 and U9)

OUTBD BOOST PUMP - 1 and 3 (U13 and U14)

On pilots overhead circuit breaker panel CB1, zone 210, open and tag circuit breaker FUEL SHUTOFF VALVE - TANK ENG 2 (D11).

R

(3) In the hydraulic service center compartment, zone 147, manually close the three fuel crossfeed valves, and the engine No. 2 tank valve (Ref. Fig. 401).

(4) Disconnect linkage between the two shutoff valves. If tank No. 2L shutoff valve is being replaced, manually close tank No. 2R shutoff valve. If tank No. 2R shutoff valve is being replaced, manually close tank No. 2L shutoff valve. Lock-wire and tag linkage of closed valve.

(5) Remove drain plugs at inlet ports of fuel flow equalizer and drain all fuel from equalizer and fuel feed manifold to the open shutoff valve.

(6) Remove fuel flow equalizer (Ref. 28-24-13).

(7) While manual shutoff valve is being supported, enter wing center section and remove the shutoff valve attach bolts and washers. Remove manual shutoff valve.

B. Installation

(1) Verify that the circuit breakers opened in Step 4A(2) are open and tagged.

(2) Install new O-ring in mating flange of new manual shutoff valve. Lubricate seal with grease (Ref. Fig. 401).

(3) While shutoff valve is being held in installed position, enter wing center section and install shutoff valve attach washers and bolts. Install lock-wire between bolt heads.

(4) Manually close the shutoff valve and reconnect linkage to adjacent shutoff valve. Remove lock-wire and tag

installed in Step 4A(4). Exercise extreme care not to open shutoff valves until fuel flow equalizer is installed.

(5) Install fuel flow equalizer (Ref. 28-24-13).

(6) Actuate shutoff valve linkage to open the valves. Install lock-wire to retain linkage in this position.

(7) Manually open the fuel control valves closed in Step 4A(3).

(8) Remove tags and close circuit breakers opened in Step 4A(2).

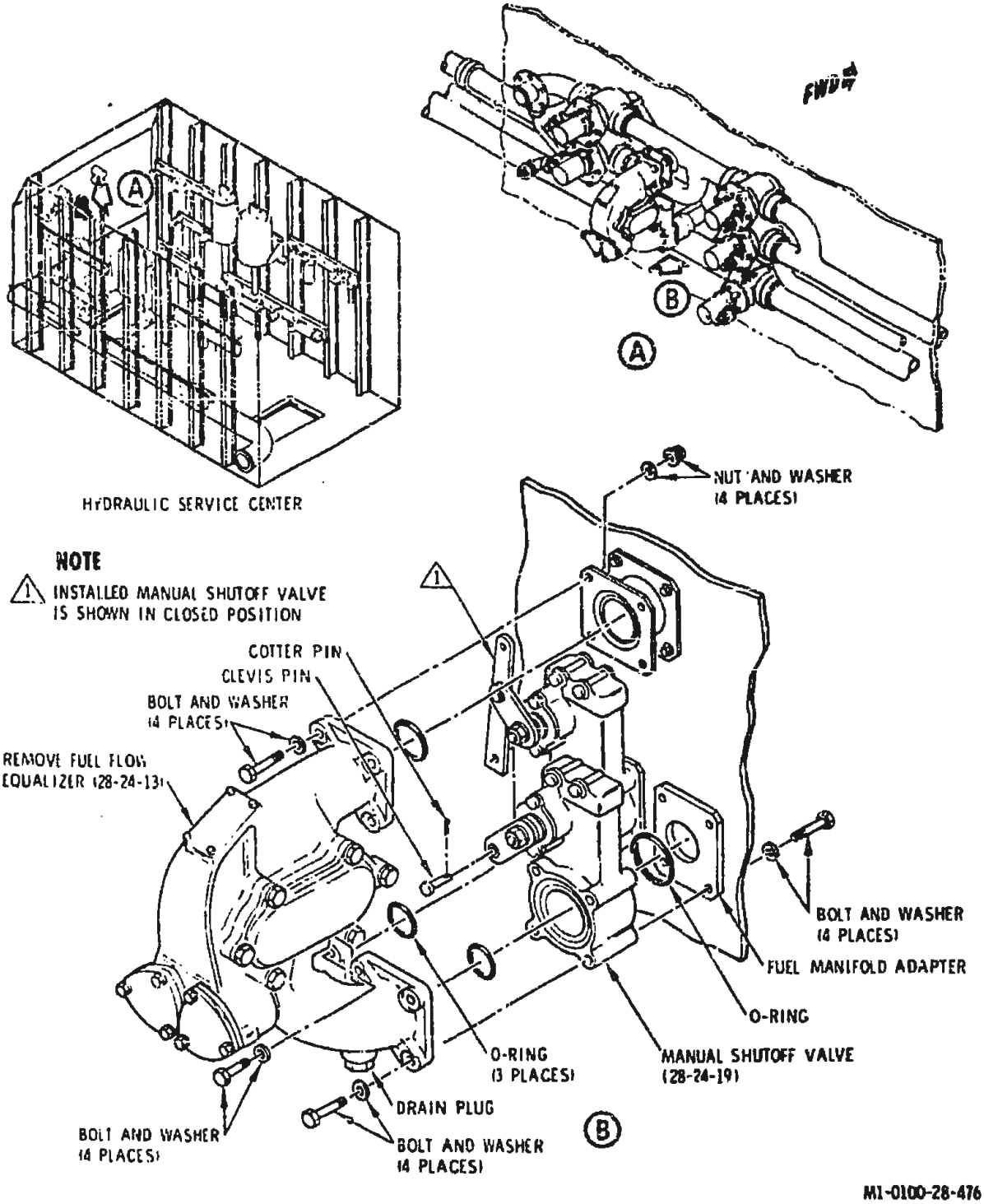
(9) Refuel tank No. 2L or 2R (Ref. 12-11-00).

(10) Turn on electrical power (Ref. 24-00-00).

(11) At Flight Engineer/Second Officers FUEL SYSTEM panel, zone 215, electrically close engine No. 2 tank valve.

(12) Pressurize engine No. 2 fuel feed system and visually check fuel flow equalizer and manual shutoff valve installations for signs of fuel leakage (Ref. 28-24-00).

(13) Turn off electrical power (Ref. 24-41-00).



R Manual Shutoff Valve - Removal and Installation
R Figure 401

CR

FUEL SYSTEM O-RINGS - MAINTENANCE PRACTICES

CR 1. General

CR A. O-Rings - Fuel System

CR (1) Omniseals may be replaced by Fluorosilicone o-rings, CR M25988-1-(size). The following is an example of the CR cross-reference procedure:

CR	Omniseal	O-Ring (Fluorosilicone)
CR	AR10105-338A1H	M25988-1-338

ENGINE NO. 2 FUEL FEED LINE HOSES - REMOVAL AND INSTALLATION

1. General

These procedures apply to removal and installation of the No. 2 engine fuel feed line hose assemblies listed below. Each hose removal and installation procedure is presented as a separate task and is preceded by the common preparatory steps in Paragraph A.

Hydraulic Service Center (Para. B and C)

FS 1323.00 to FS 1585.00 (Para. D and E)

FS 1585.00 to FS 1860.00 (Para. F and G)

Center Engine Fuel Line FS 1860.00 (Para. H and I)

2. Equipment and Materials

Air pressurizer terminating in a 3/8-inch hose having an MS 21926-6 nut and MS 21922-6 sleeve, and equipment that will maintain a regulated 15 psig air supply

Cap, MS 21914-6, or equivalent

Grease, Fluorosilicone, Dow Corning FS 1291, or equivalent

Preformed Packing (Ref. Fig. 401)

Omniseal or fluorosilicone O-ring

Sealing Compound, LCM40-2180 Type II, or equivalent

Lock-wire, Fed Spec QQ-W-390, 0.032-inch diameter, or equivalent

R Container, Approved waste fuel (2 required)

3. Referenced Procedures

6-50-00	Interior Access Doors and Removable Panels - Description and Operation
20-36-01	Single T-Bolt V-Band Coupling - Removal and Installation
24-00-00	Electrical Power System - Maintenance Practices

24-32-03	Nickel-Cadmium Battery - Removal and Installation
24-41-00	External Power/Ground Service System - Maintenance Practices
25-51-00	Cargo Compartments - Description and Operation
28-20-01	WIG-O-FLEX Couplings - Maintenance Practices
29-11-00	Hydraulic Power System - Description and Operation
71-00-03	Fuselage-Mounted QEC Unit (Engine No. 2) - Removal and Installation

4. Removal/Installation

A. Preparation

(1) Disconnect external electrical power source from external power receptacle (Ref. 24-41-00). Tag receptacle.

(2) Disconnect aircraft battery connector (Ref. 24-32-03). Tag connector.

(3) Attach FUEL SYSTEM MAINTENANCE-IN-PROGRESS tag to Flight Engineer/Second Officers lower panel, zone 215.

(4) Manually close No. 2 engine tank valve in hydraulic service center, zone 147. (Valve is identified by VALVE - TANK - CENTER ENG FUEL placard on wing center section rear beam.)

On aircraft 001-016 without SB28-019, visually verify that APU tank valve on wing center section rear beam is closed. (Valve is identified by VALVE, SHUTOFF APU FUEL placard on wing center section rear beam.)

(5) Attach a fuel drain hose to center engine fuel line drain valve fitting mounted on wing center section rear beam. Route open end of line into an approved container below aircraft.

WARNING: BEFORE ENTERING AFTERBODY SECTION, ZONE 316, ENSURE THAT ALL FOUR HYDRAULIC SYSTEMS ARE SHUT OFF AND EXTERNAL HYDRAULIC POWER IS REMOVED FROM AIRCRAFT (REF. 29-11-00). INSTALL CONTROL COLUMN AND TRIM WHEEL LOCK BA80-101 OR EQUIVALENT.

(6) Manually open No. 2 engine primary fuel shutoff valve, in afterbody section, zone 316, (Ref. 28-24-00) and secondary fuel shutoff valve (if closed).

R (7) Place an approved container under the No. 2 engine fuel
R supply line drain plug, zone 432, (Ref. 71-00-03).
R Remove plug and drain fuel from supply line into
R container. Do not reinstall drain plug at this time.

R NOTE: The No. 2 engine fuel supply drain plug, zone
R 432, is removed to provide a vent to allow fuel
R to drain from the fuel feed line drain valve,
R zone 147.

(8) Open fuel feed line drain valve, in hydraulic service center, zone 147. Approximately five gallons of fuel will be drained from line.

(9) Remove fuel overboard drain hose and temporarily reinstall drain fitting cap.

R (10) Reinstall No. 2 engine fuel supply line drain plug and
R install lock-wire (Ref. 71-00-03).

B. Fuel Hose Removal (Hydraulic Service Center, Zone 147)

(1) Drain No. 2 engine fuel feed line (Ref. Step 4A).

(2) Disconnect fuel hose at wing center section rear beam by removing four flange attach bolts and washers (Ref. Fig. 401).

(3) Disconnect aft end of hose at FS 1323.00 floor beam by removing four flange attach bolts.

(4) Complete removal of fuel hose by removing hose support clamps.

C. Fuel Hose Installation (Hydraulic Service Center, Zone 147)

(1) Install two new preformed packings in forward fuel hose flange assembly. Lubricate packing with specified grease and connect hose to fitting on wing center section rear beam using four attach bolts and washers.

(2) Install two new preformed packings in aft fuel hose flange assembly. Lubricate packing with specified grease and connect hose to coupling at FS 1323.00 floor beam using four attach bolts.

(3) Support fuel hose in its installed position and install hose support clamps (Ref. Fig. 401).

(4) Disconnect and cap APU fuel inlet line flex hose. Cap flex hose fitting on fuel line shroud, in afterbody area, zone 316.

(5) Manually close No. 2 engine primary fuel shutoff valve.

(6) Pressure check reassembled fuel hose connections by applying 40 psig air pressure to fuel line through drain fitting on center section rear beam. Fuel line must hold this pressure with no signs of leakage.

(7) Remove air pressure hose and cap drain fitting. Close and lock-wire fuel line drain valve.

(8) Manually open ENG 2 TANK VALVE.

(9) Remove caps and connect APU fuel line flex hose to fitting on No. 2 engine fuel line shroud.

(10) Remove control column and trim wheel lock.

(11) Reconnect aircraft battery (Ref. 24-32-03).

D. Fuel Hose Removal (FS 1323.00 to FS 1585.00)

(1) Drain No. 2 engine fuel feed line (Ref. Step 4A).

(2) Lower sufficient portions of ceiling panels 155JB, 155GB and 155FB, in center cargo compartment, zone 151, to gain access to fuel hose shroud coupling at FS 1590.

(3) Remove V-Band clamp and slide telescoping section of shroud aft.

(4) Disconnect bonding jumper and remove bonding clamp from hose being removed.

(5) Disassemble WIG-O-FLEX coupling and remove retainer halves (Ref. 28-20-01).

(6) In hydraulic service center, zone 147, remove V-band clamp from shroud.

(7) Disconnect shroud drain line and slide telescoping section of shroud aft to expose fuel line connection.

(8) Disconnect bonding jumper and remove bonding clamp from hose being removed.

(9) Disassemble WIG-O-FLEX coupling. Remove two split washers, preformed packing, and coupling nut at forward

end of hose being removed. Retain split washers and coupling nut for reinstallation on new hose.

(10) Pull hose out of shroud and into center cargo compartment.

(11) Remove split washer, preformed packing, and coupling body from aft end of hose. Retain split washer and coupling body for reinstallation on new hose.

E. Fuel Hose Installation (FS 1323.00 to FS 1585.00)

(1) Inspect omniseals located at shroud V-band clamp flange and between fixed and telescoping sections of shroud in center cargo compartment, zone 155. Omniseal surfaces must be smooth with no nicks or grooves. Replace seal if there is any doubt as to serviceability (Ref. Fig. 401 and 402).

NOTE: Fluorosilicone O-rings may be installed in place of Omniseals.

(2) Repeat preceding Step (1) in hydraulic service center, zone 147.

(3) Insert hose into shroud, in center cargo compartment and slide it forward until it projects out of shroud in hydraulic service center. Install WIG-O-FLEX coupling body, split washer and preformed packing at aft end of hose. Lubricate packing with specified grease (Ref. 28-20-01).

(4) In hydraulic service center, install WIG-O-FLEX coupling nut, split washers, and preformed packing on forward end of hose with packing located between washers. Lubricate packing with specified grease.

(5) Engage fuel hose to fuel hose coupling and assemble WIG-O-FLEX coupling.

(6) Install new bonding clamp and attach bonding jumper to clamp. Install lock-wire between WIG-O-FLEX coupling nut and bonding clamp. Do not close shroud at this time.

(7) Install new preformed packing on fuel hose installed between FS 1325.00 and cabin pressure bulkhead in center cargo compartment. Lubricate packing with specified grease and reinstall split washer.

(8) Place WIG-O-FLEX coupling halves in position and reassemble coupling.

(9) Attach bonding jumper to hose using new bonding clamp. Install lock-wire between WIG-O-FLEX coupling nut and bonding clamp.

(10) In afterbody area, zone 316, disconnect and cap APU fuel inlet line flex hose. Cap flex hose fitting on fuel line shroud.

(11) Pressure check reassembled fuel hose connections by applying 40 psig air pressure to fuel line through drain fitting on center section rear beam. Fuel line must hold this pressure with no signs of leakage.

(12) Brush 0.020 to 0.030-inch coat of LCM40-2180 Type II sealing compound over bonding jumper attach parts in hydraulic service center. Add fillet seal of compound around edges of bonding jumper clamp.

(13) Slide telescoping section of the shroud forward and install V-band clamp (Ref. 20-36-01).

(14) Repeat preceding Steps (12) and (13) in center cargo compartment.

(15) In afterbody area, manually close No. 2 engine primary fuel shutoff valve.

(16) Air pressure check No. 2 engine fuel line shroud (Ref. Para. 4J).

(17) Manually open ENG 2 TANK VALVE closed in Step 4A(4).

(18) Remove caps and connect APU fuel inlet line flex hose to fitting on No. 2 engine fuel line elbow.

(19) Remove control column and trim wheel lock.

(20) Reconnect aircraft battery (Ref. 24-32-03).

(21) Reinstall partially removed center cargo compartment ceiling panels (Ref. 6-50-00 and 25-51-00).

(22) Bleed No. 2 engine fuel feed line and check for leaks (Ref. Para. 4K).

F. Fuel Hose Removal (FS 1585.00 to 1860.00)

(1) Drain No. 2 engine fuel feed line (Ref. Step 4A).

(2) Lower sufficient portions of ceiling panels 155JB, 155GB, and 155FB, in center cargo compartment, zone

151, to gain access to fuel hose shroud coupling at FS 1590.

(3) Remove V-band clamp and slide telescoping section of shroud aft to expose fuel line connection.

(4) Disconnect bonding jumper and remove bonding clamp from hose being removed.

(5) Disassemble WIG-O-FLEX coupling and remove retainer halves (Ref. 28-20-01). Remove split washer, preformed packing, and coupling body.

(6) In afterbody section, zone 316, disconnect and cap APU fuel inlet flex hose. Cap flex hose fitting on No. 2 engine fuel line elbow (Ref. Fig. 401).

(7) Disconnect bonding jumper at shroud drain line and disconnect shroud drain line.

(8) Disassemble WIG-O-FLEX coupling at fuel line connected to outlet flange of elbow (Ref. 28-20-01).

(9) Loosen shroud coupling nut at location where fuel line emerges from cabin pressure bulkhead.

(10) Using elbow, pull hose assembly aft into afterbody area until WIG-O-FLEX coupling is exposed.

(11) Disconnect bonding jumper and remove bonding clamp on hose being removed.

(12) Disassemble WIG-O-FLEX coupling and remove retainer halves (Ref. 28-20-01). Remove separated fuel line elbow.

(13) Remove split washer, preformed packing, and WIG-O-FLEX body from hose being removed.

(14) In center cargo compartment, pull hose out of shroud and into cargo compartment.

G. Fuel Hose Installation (FS 1585.00 to 1860.00)

NOTE: Fluorosilicone O-rings may be installed in place of Omniseals.

(1) Inspect omniseals at shroud V-band clamp flange and between telescoping and fixed sections of shroud, in center cargo compartment, zone 155. Omniseal surface must be smooth with no nicks or grooves visible.

Replace omniseal if there is any question concerning serviceability (Ref. Fig. 401 and 402).

(2) Insert hose into shroud and push hose aft until it emerges into afterbody area, zone 316.

(3) In afterbody area, install WIG-O-FLEX coupling body, split washer, and new preformed packing on aft end of hose. Lubricate O-ring packing with specified grease.

(4) Inspect omniseal on elbow to shroud coupling flange. Replace omniseal if there is any question as to serviceability.

(5) Connect elbow to hose by installing WIG-O-FLEX retainer halves and assembling coupling.

(6) Install new bonding clamp on aft end of new hose and attach bonding jumper. Lock-wire coupling nut to clamp and coat jumper attaching parts with 0.020 to 0.030-inch film of LCM40-2180 Type II sealing compound. Add fillet of sealing compound around all edges of bonding clamp.

(7) Install new O-ring packing in WIG-O-FLEX coupling at outlet flange of elbow. Lubricate packing with specified grease.

(8) Push hose into shroud and connect outlet flange of elbow to flex hose by assembling WIG-O-FLEX coupling. Before tightening coupling nut, engage coupling nut on shroud to threaded flange on elbow. Tighten both coupling nuts and install lock-wire.

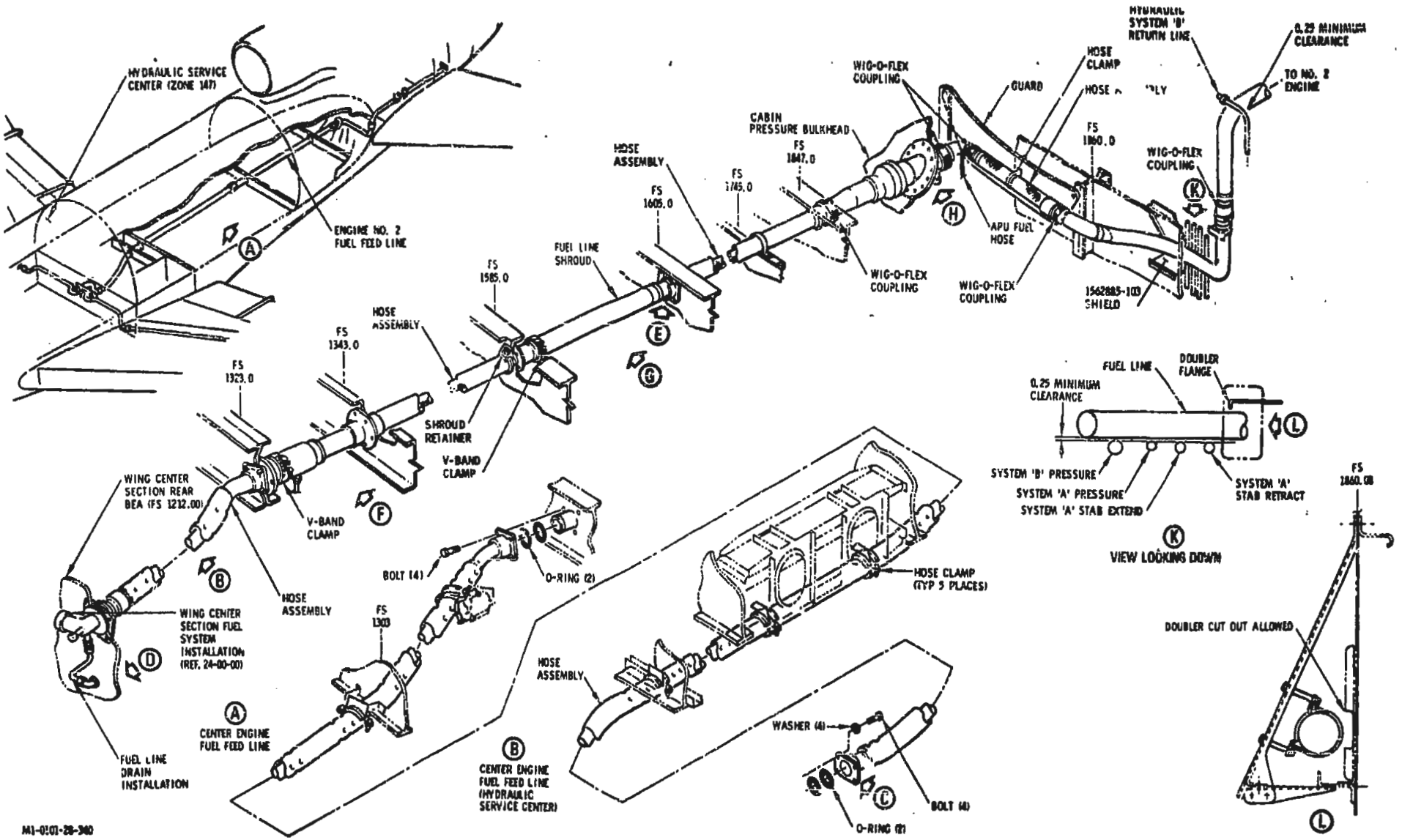
(9) Connect elbow bonding jumper to clamp on shroud drain line. Coat attaching parts with 0.020 to 0.030-inch film of LCM 40-2180 Type II sealing compound.

(10) Remove cap and connect APU fuel inlet hose to fitting on elbow.

(11) Install WIG-O-FLEX coupling nut, split washer, and preformed packing on forward end of hose (Ref. Fig. 401 and 28-20-01) in center cargo compartment. Lubricate O-ring packing with specified grease.

(12) Install WIG-O-FLEX coupling retainer halves and assemble coupling.

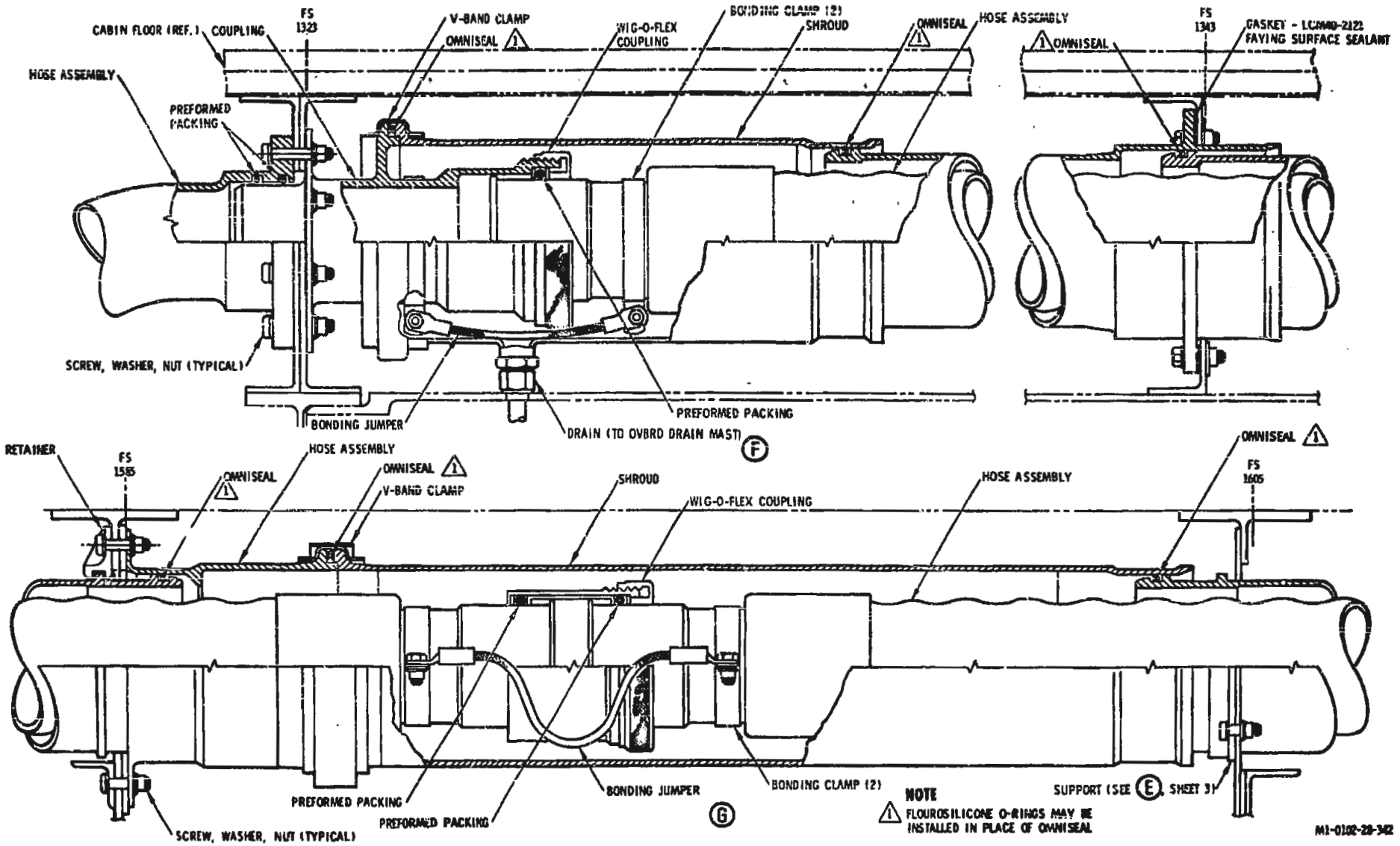
(13) Install bonding clamp on hose and attach bonding jumper. Install lock-wire between coupling nut and clamp. Coat jumper attaching parts with 0.020 to



R No. 2 Engine Fuel Hose - Removal and Installation
R Figure 401 (Sheet 1)

EFFECTIVITY: ALL

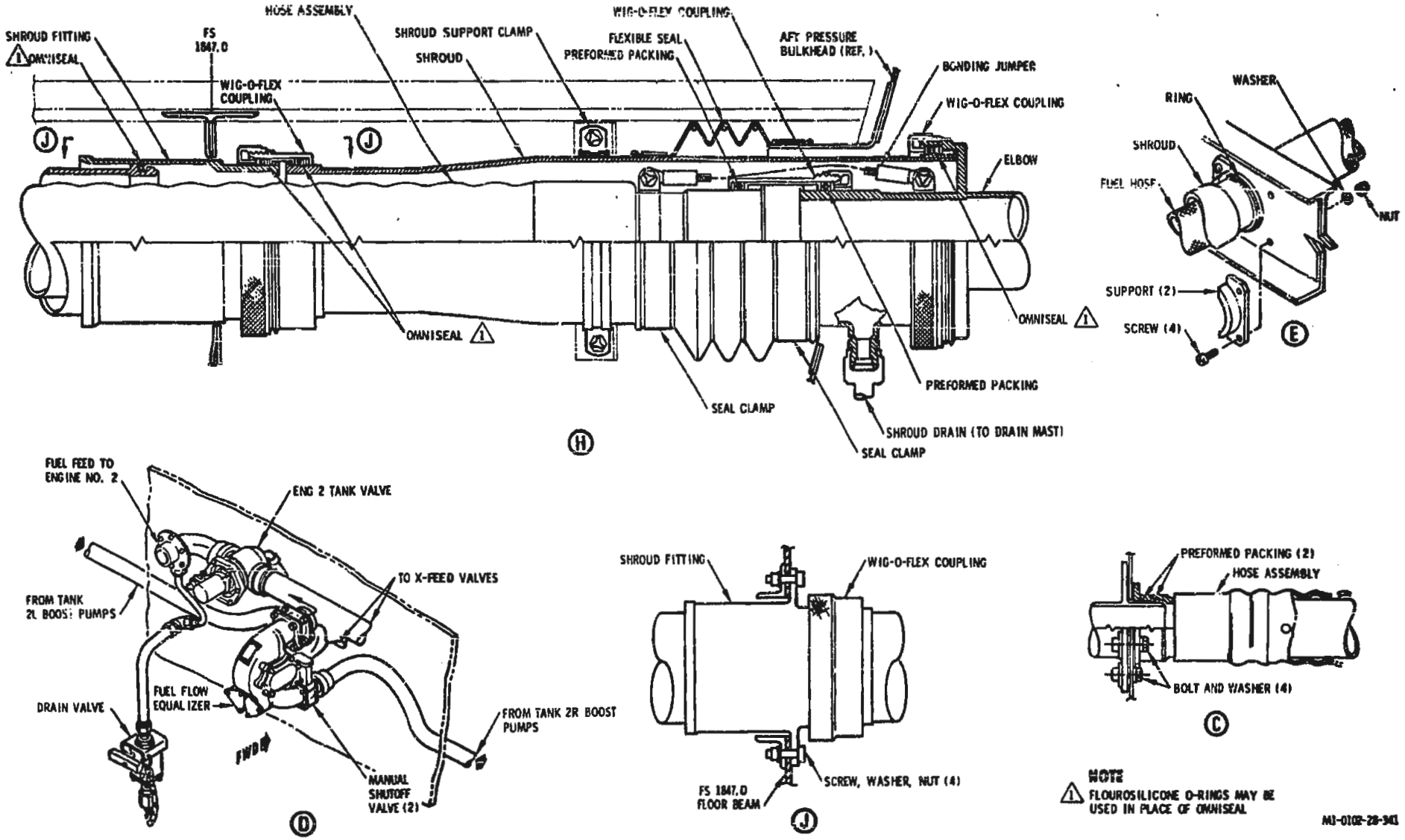
001B



R No. 2 Engine Fuel Hose - Removal and Installation
R Figure 401 (Sheet 2)

EFFECTIVITY: ALL

001B



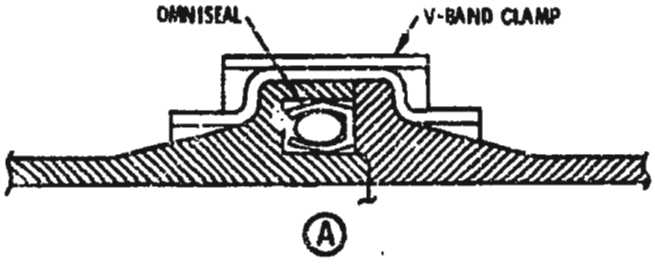
NOTE
1. FLOUROSILICONE O-RINGS MAY BE USED IN PLACE OF OMNISEAL

M1-0102-28-343

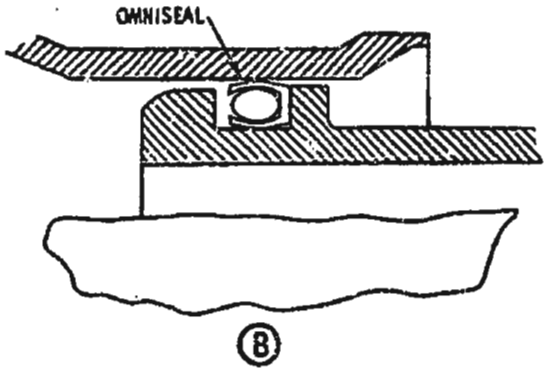
R No. 2 Engine Fuel Hose - Removal and Installation
R Figure 401 (Sheet 3)

EFFECTIVITY: ALL

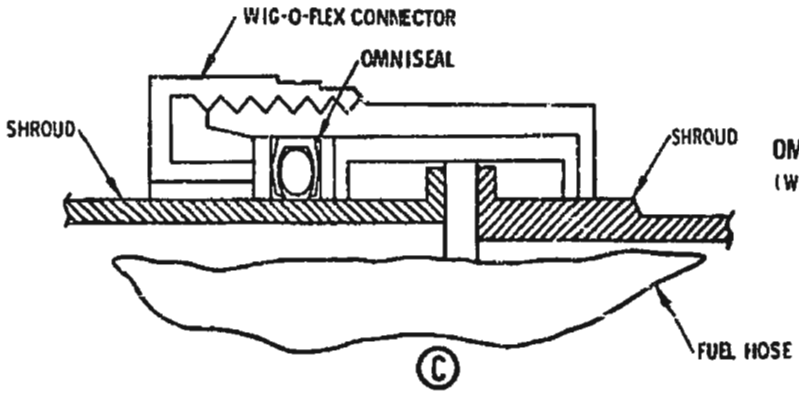
001B



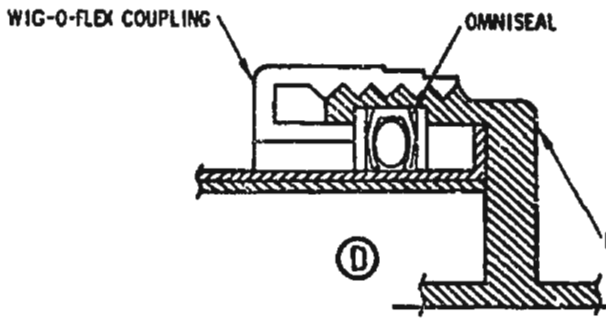
OMNISEAL INSTALLATION
(TYPICAL SHROUD SEAL AT V-BAND CLAMPED FLANGES LOCATED AT FS 1333 AND FS 1590)



OMNISEAL INSTALLATION
(TYPICAL SHROUD SEAL AT FS 1333 FS 1343, FS 1585, FS 1605, AND FS 1847)



OMNISEAL INSTALLATION
(WIG-O-FLEX CONNECTOR AT FS 1847)



OMNISEAL INSTALLATION
(FS 1847, ZONE 318)

M1-0100-28-350

R Engine No. 2 Fuel Hose Shroud Seals
R Figure 402

R EFFECTIVITY: ALL
R
001B

0.030-inch film of LCM40-2180 Type II sealing compound. Add fillet of sealing compound around all edges of bonding clamp.

(14) Air pressure check reassembled fuel hose connections by applying 40 psig air pressure to fuel line through drain fitting on center section rear beam. Fuel line must hold this pressure with no signs of leakage.

(15) Brush 0.020 to 0.030 inch coat of LCM40-2180 Type II sealing compound over bonding jumper attach parts in center cargo compartment. Add fillet seal of compound around edges of bonding jumper clamp.

(16) Slide telescoping section of shroud forward and install V-band clamp (Ref. 20-36-01).

(17) Manually close No. 2 engine primary fuel shutoff valve, in afterbody area.

(18) Air pressure check No. 2 engine fuel line shroud (Ref. Step 4J.).

(19) Remove caps and connect APU fuel inlet line flex hose to fitting on fuel line elbow just aft of cabin pressure bulkhead.

(20) Manually open ENG 2 TANK VALVE closed in Step 4A(4).

(21) Remove control column and trim wheel lock.

(22) Reconnect aircraft battery (Ref. 24-32-03).

(23) Reinstall partially removed center cargo compartment ceiling panels (Ref. 6-50-00 and 25-25-00).

(24) Bleed No. 2 engine fuel feed line and check for fuel leaks (Ref. Step 4K).

H. Fuel Hose Removal (No. 2 Engine Fuel Line FS 1860.00)

(1) Drain center engine fuel feed line (Ref. Step 4A).

(2) Disassemble WIG-O-FLEX couplings at both ends of hose (Ref. Fig. 401 and 28-20-01), in afterbody section, zone 316.

(3) Remove hose support clamp.

(4) Remove coupling parts from removed hose.

I. Fuel Hose Installation (No. 2 Engine Fuel Line FS 1860.00)

(1) Install WIG-O-FLEX coupling nut and split washer at both end of hose.

(2) Install new preformed packing in flanges of fuel line elbow and line to No. 2 engine, in afterbody section. Lubricate packings with specified grease (Ref. Fig. 401 and 28-20-01).

(3) Install fuel hose by engaging coupling nuts to threaded flanges on elbow and fuel line. Take care not to dislodge preformed packing when assembling the couplings. Install lock-wire between coupling nut and flanges.

(4) Install hose support clamp.

(5) Inspect installation to be sure that hose support clamp prevents hose from being chafed by fiberglass shield or clamp bracket.

(a) After fitting the hose check that the connecting fuel pipe on the aft face of FS 1860 bulkhead has not been disturbed and that a clearance of at least 0.25 inch exists between the No. 2 engine feed pipe and the four hydraulic lines and bulkhead doubler outboard of exit hole in the FS 1860 bulkhead.

(b) Check that a clearance of at least 0.25 inch exists between feed pipe and System B return line swaged Dynatube nut assembly where fuel pipe makes a 90 degree turn from vertical to horizontal.

(c) Check that a minimum clearance of 0.25 inch exists as follows:

- Between fuel line and fuel line guard.
- Between fuel line guard and adjacent structure (FS 1860).
- Between fuel line and aft pressure bulkhead.

(d) If insufficient clearance exists between fuel line and adjacent structure, reposition fuel line in support clamp (Ref. Fig. 401).

(e) Check that a minimum clearance of 0.12 inch exists as follows:

- Between fuel line guard and aft pressure bulkhead.

• Between fuel line and adjacent structure (FS 1860).

(f) If insufficient clearance exists between fuel line guard and aft pressure bulkhead or afterbody bulkhead (FS 1860), install washers between guard and support bracket in accordance with SB53-218.

(6) Manually close No. 2 engine primary fuel shutoff valve.

(7) Manually open No. 2 ENG TANK VALVE, in hydraulic service center, zone 146.

(8) Reconnect aircraft battery (Ref. 24-32-05).

(9) Pressurize No. 2 engine fuel feed line and check hose couplings for leakage.

(10) Remove control column and trim wheel lock.

(11) Bleed No. 2 engine fuel feed line and check for fuel leakage (Ref. Step 4K).

J. Air Pressure Check (No. 2 Engine Fuel Line Shroud)

(1) Disconnect shroud drain line located just aft of FS1323 floor beam, in hydraulic service center, zone 147. Cap fitting with MS21914-6 cap.

(2) Disconnect shroud drain line located just aft of the cabin pressure bulkhead and connect line from regulated (15 psig) air pressurizer. Gradually apply 15 psig regulated air pressure to shroud. Close air line shutoff valve and observe shroud pressure for a minimum of 10 minutes. There must be no more than 1 psig loss in pressure.

CAUTION: SHROUD AIR PRESSURE MUST NEVER BE ALLOWED TO EXCEED FUEL FEED LINE PRESSURE BY MORE THAN 30 PSIG. IF SHROUD AIR PRESSURE IS INCREASED TO AID IN LOCATING A LEAK, FUEL LINE MUST FIRST BE PRESSURIZED AS NECESSARY TO MAINTAIN 30 PSI MINIMUM PRESSURE DIFFERENTIAL. DO NOT INCREASE SHROUD PRESSURE MORE THAN 50 PSIG. DECREASE SHROUD PRESSURE TO LESS THAN 15 PSIG BEFORE RELIEVING FUEL LINE PRESSURE.

(3) Decrease shroud pressure to 0 psig and remove air pressurizing hose. Reconnect shroud drain lines.

(4) Close and safety-wire fuel line drain valve, if open, and cap drain fitting, in hydraulic service center.

K. Air Bleed and Fuel Leakage Check (No. 2 Engine Fuel Feed Line)

(1) Apply external electrical power (Ref. 24-41-00).

C C CAUTION: IF BOOST PUMP CIRCUIT BREAKER TRIPS, DO NOT RESET UNTIL IT IS VERIFIED THAT CIRCUIT BREAKER TRIP IS NOT CAUSED BY MALFUNCTION IN BOOST PUMP ASSEMBLY.

(2) Turn on one fuel boost pump in tank 2L and one in tank 2R.

(3) Bleed center No. 2 engine fuel inlet line by loosening engine fuel inlet line drain plug (Ref. 71-00-03), then tighten drain plug and install lock-wire.

(4) Check visible No. 2 engine fuel feed line hose connections for leakage. (When fuel hose connections are enclosed by shroud and not visible, check for leakage at drain masts.)

(5) Turn off boost pumps.

(6) Remove electrical power (Ref. 24-00-00).

C FUEL FEED LINE, NO. 2 ENGINE - INSPECTION/CHECK

C 1. Check No. 2 Engine Fuel Feed Line Installation

C A. Gain access to the aft side of the FS 1860 bulkhead through
C the 317AB access door, reference Figure 801, Sheet 1.

C B. Measure the minimum clearance between the 1515816-161 Tube
C Assembly and the following points:

C (1) The following hydraulic lines, reference Figure 801,
C Sheet 2, View C.

C SYSTEM 'B' PRESSURE

C SYSTEM 'A' PRESSURE

C SYSTEM 'A' STAB EXTEND

C SYSTEM 'A' STAB RETRACT

CR (2) 1504745-615 Doubler Flange and associated fuel line
CR transition hole reference Figure 801, Sheet 3, View E,
CR and Sheet 2, View C.

C C. If the clearance is 0.25 inch or more at all five points
C measured, no corrective action is required. Close access
C door 317AB.

C D. If the clearance is less than 0.25 inch at any of the five
C points measured, corrective action is required (Ref.
C 28-24-20/801.)

CR

FUEL FEED LINE, NO. 2 ENGINE - REPAIRS

CR 1. Repair No. 2 Engine Fuel Feed Line Installation

CR NOTE: If the check of 28-24-20/601 indicates any clearance not
CR adequate, a repair in accordance with the following
CR instructions is required.

CR A. Drain the No. 2 engine fuel line, reference Maintenance
CR Manual 28-24-20/401.

CR B. Remove and retain the following hydraulic line support
CR hardware, reference Figure 801, Sheet 2, View B.

CR (1) Clamps and 151112-107 Bracket for the SYSTEM 'A' STAB
CR EXTEND and SYSTEM 'A' STAB RETRACT lines immediately
CR above the 1515816-161 Tube Assembly (drill out the
CR bracket attaching rivets).

CR (2) Clamps and 1551728-103 Bracket for the SYSTEM 'A'
CR PRESSURE and SYSTEM 'B' PRESSURE lines immediately
CR above the 1515816-161 Tube Assembly (drill out the
CR bracket attaching rivets).

CR C. Remove and retain the 1562885-103 Shield Assembly by
CR drilling out the eleven attaching rivets, reference Figure
CR 801, Sheet 3, View D.

CR D. Mark the 1504745-615 Doubler Flange where it is closest to
CR the 1515816-161 Tube Assembly in preparation for removal of
CR flange material, reference Figure 801, Sheet 3, View E.

CR E. Remove and retain clamps and jumper at upper (outboard) end
CR of 1515816-161 Tube Assembly, reference Figure 801, Sheet 1,
CR View A.

CR F. Remove and retain 1515816-161 Tube Assembly as follows:

CR (1) Disconnect fittings at each end of tube assembly,
CR reference Maintenance Manual 28-20-01/401.

CR (2) Rotate tube assembly and lift it up and over the
CR horizontal stabilizer.

CR G. Modify and refinish 1504745-615 Doubler Flange as follows,
CR reference Figure 801, Sheet 3, View E.

CR (1) Remove material down to bendline in area 1.00 inch each
CR side of mark made in Step D.

C (2) Clean reworked area with Methyl-Ethyl-Ketone or
C Trichloroethane and dry with a clean cloth.

C (3) Prime reworked area and let dry.

C (4) Finish coat the reworked area with polyurethane enamel
C or equivalent.

C H. Reinstall 1515816-161 Tube Assembly, clamps and jumpers as
C follows, reference Figure 801, Sheet 1, View A and
C Maintenance Manual 28-20-01/401.

C (1) Install four new MS29513-330 Packings at outboard tube
C fitting and one new MS29513-034 Packing at inboard tube
C fitting.

C (2) Move tube assembly into position and attach to existing
C line.

CR (3) At outboard end of tube, reinstall LS10682D32S Clamp
C and one end of MS25083-2BB4 Jumper using NAS6103U7
C Screws and LH7559-3 Nuts.

C (4) Reinstall AN735D32 Clamp and free ends of MS25083-2BB4
C Jumper and MS25083-2BB6 Jumper (remaining end attaches
C above tube fitting) using NAS6103U7 Screw and LH7559-3
C Nut.

C I. Reinstall 1551728-103 Bracket (outboard) and 1551112-107
C Bracket (inboard) with MS20470AD5-7 Rivets, reference Figure
C 801, Sheet 2, View B.

C J. Attach hydraulic lines to 1551728-103 Bracket (outboard)
C with LS14969L16AS Clamp, LS14969L8AS Clamp, NAS6103U7
C Screws, LH7559-3 Nuts and NAS620A10L Washers or equivalent
C hardware.

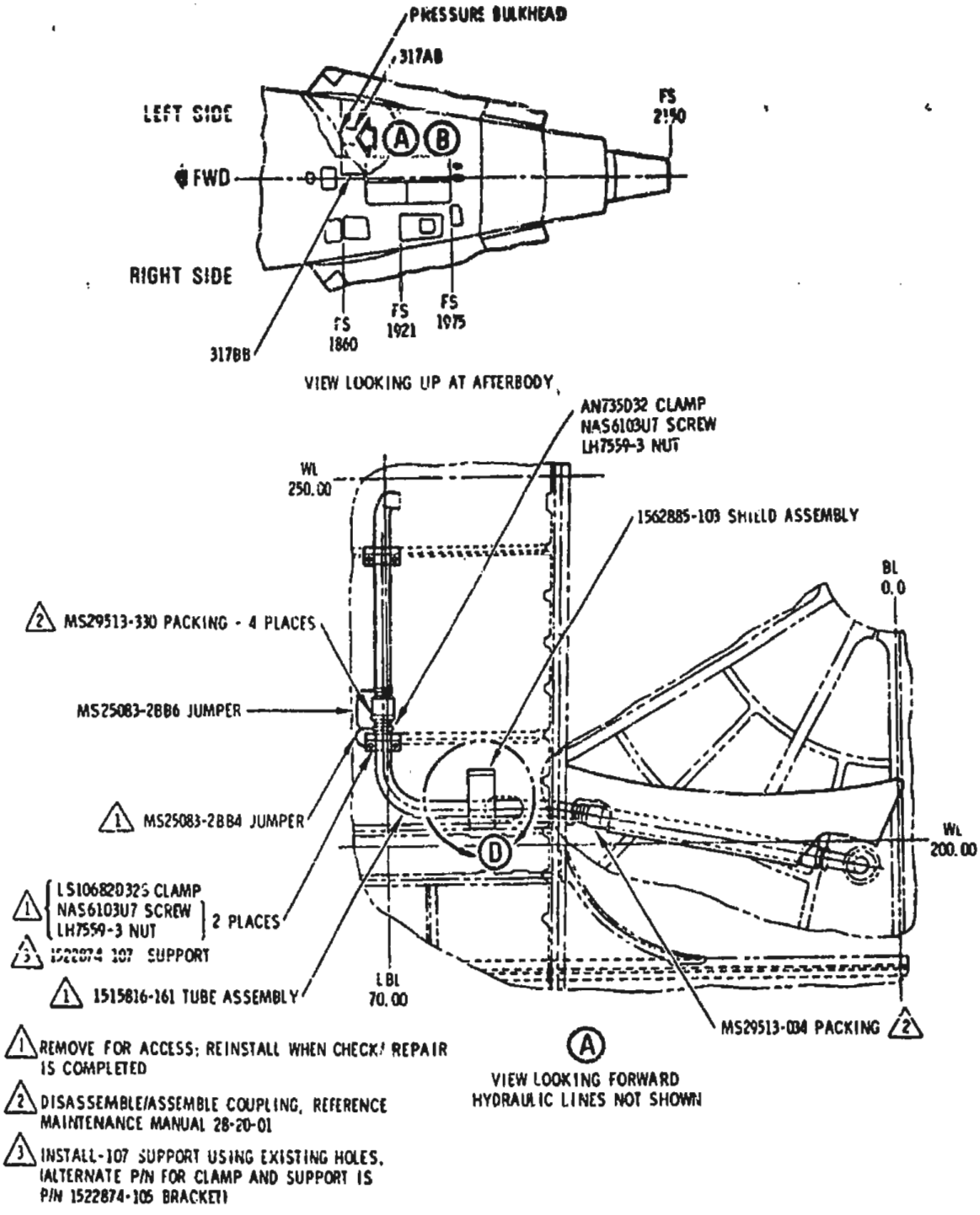
C K. Attach hydraulic lines to 1551112-107 Bracket (inboard) with
C LS14969C10AS Clamps, NAS6103U7 Screws, LH7559-3 Nuts and
C NAS620A10L Washers or equivalent hardware.

C L. Reinstall the 1562885-103 Shield Assembly, reference Figure
C 801, Sheet 3, View D.

C M. Drill two attaching holes in 1562885-103 Shield Assembly and
C install LS10682D32S Clamp, NAS43DD3-96 Spacers, NAS6103U32
C Screws, AN960D10 Washers and LH7559-3 Nuts, or equivalent
C hardware.

C N. Verify that clearances meet requirements of 28-24-20, Page
C 601.

CR 0. Close 317AB access door.



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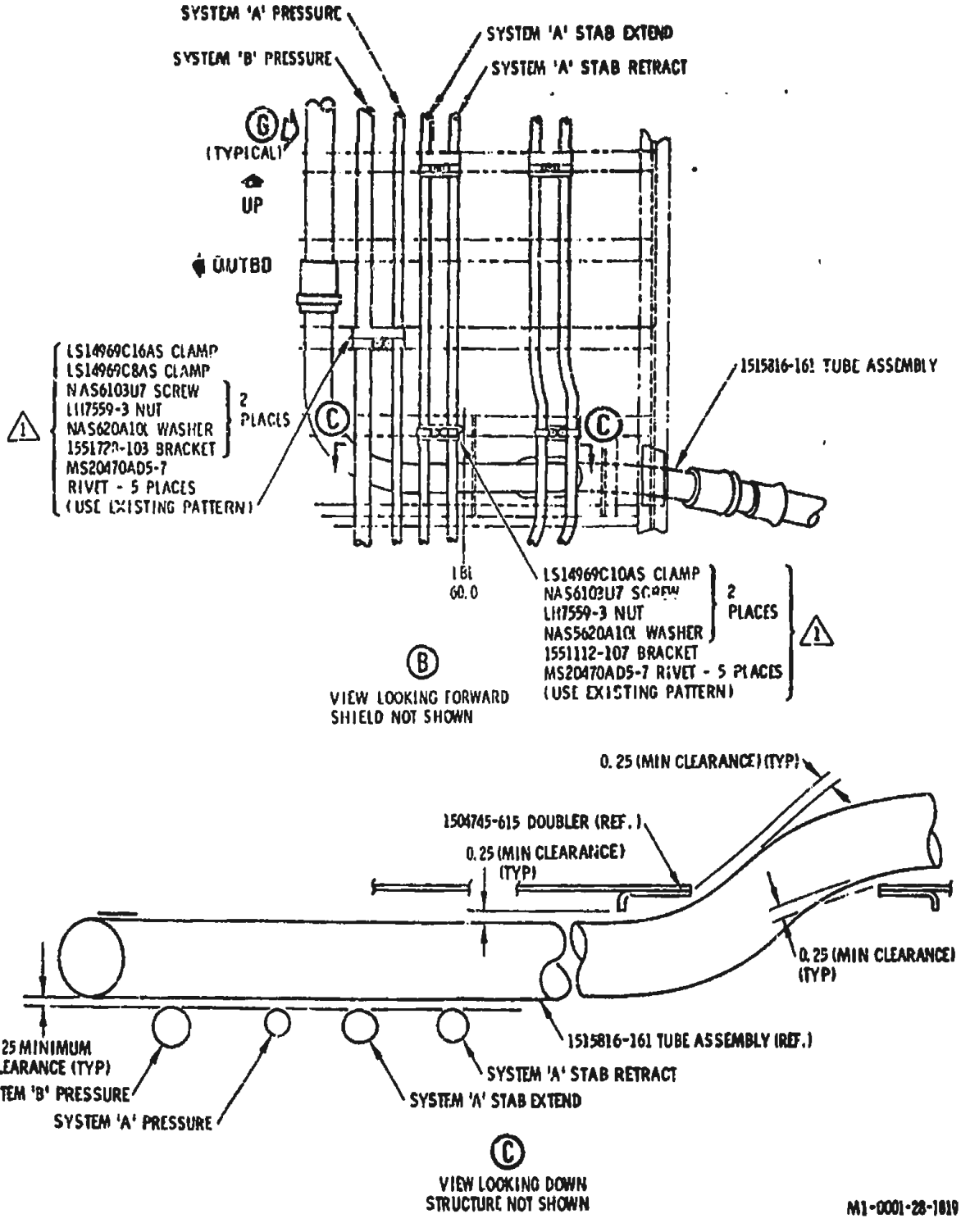
CR No. 2 Engine Fuel Line Clearance Check/Repair
CR Figure 801 (Sheet 1)

EFFECTIVITY: ALL

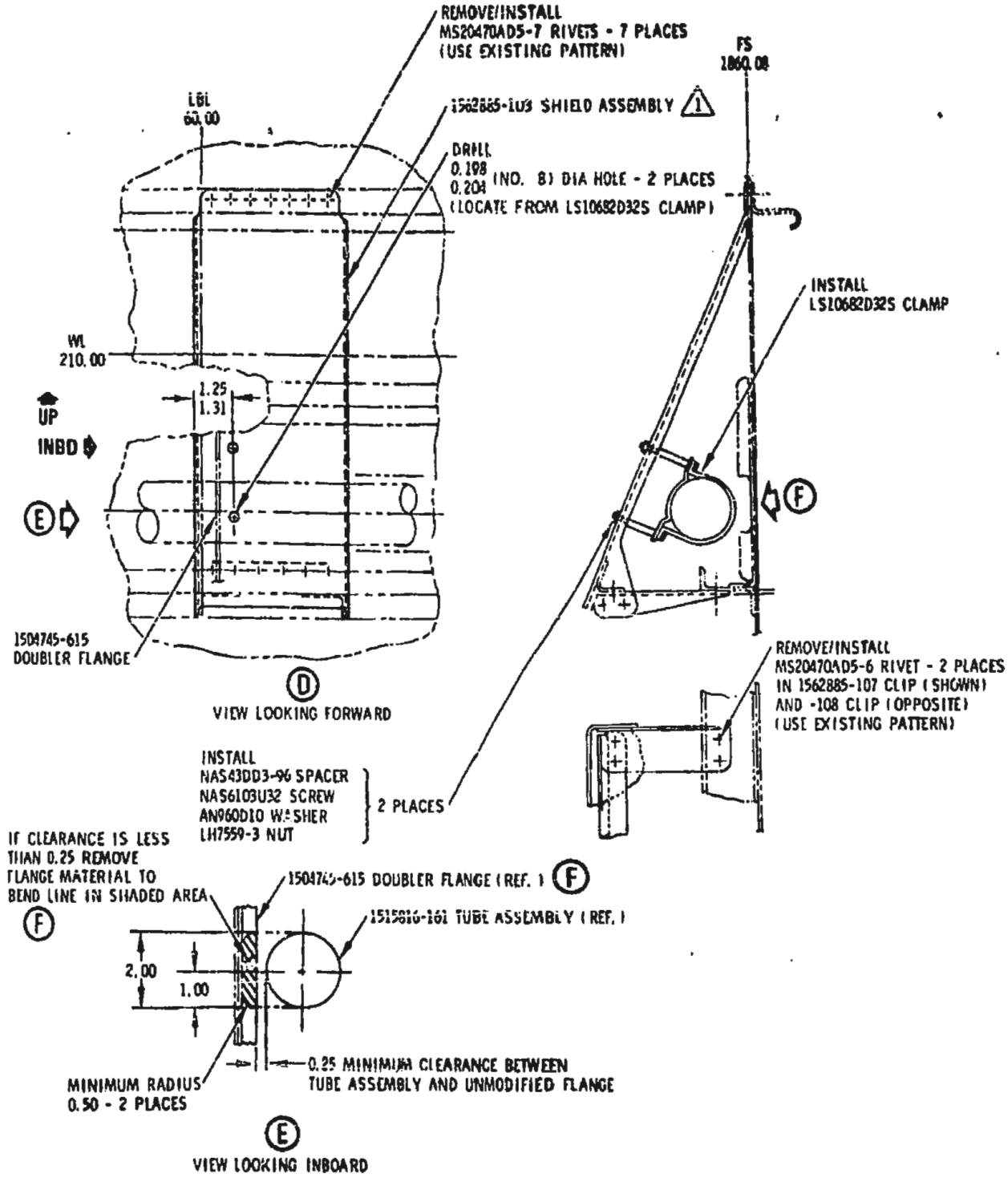
001B



CR No. 2 Engine Fuel Line Clearance Check/Repair
CR Figure 801 (Sheet 2)

EFFECTIVITY: ALL

001B



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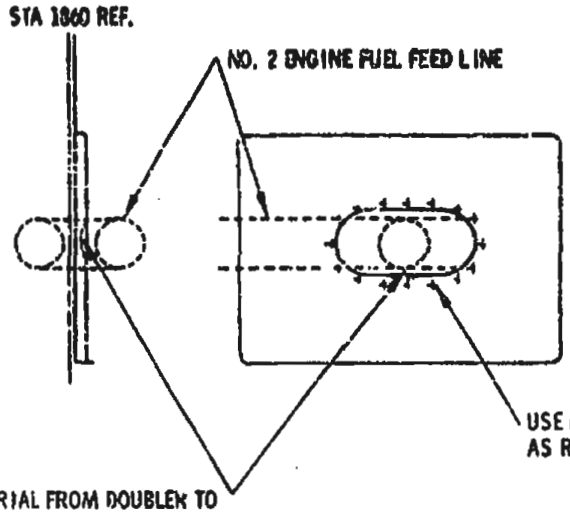
CR
CR

No. 2 Engine Fuel Line Clearance Check/Repair
Figure 801 (Sheet 3)

R EFFECTIVITY: ALL
R
001B



REMOVE MATERIAL FROM DOUBLER TO ALLOW MINIMUM CLEARANCE 0.25, FROM NO. 2 ENGINE FUEL FEED LINE.

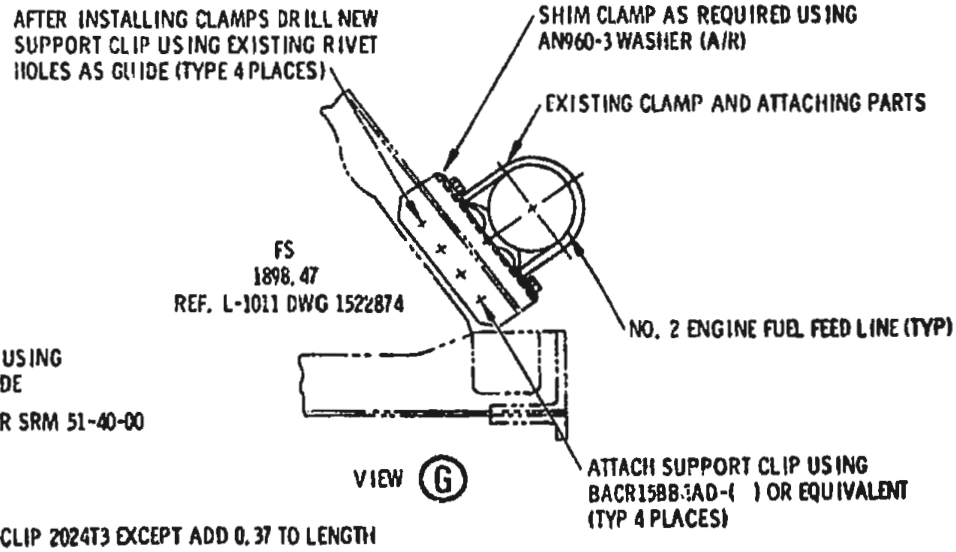
MAINTAIN MIN. 2D EDGE DISTANCE FROM RIVETS

IF 2D MIN. EDGE DISTANCE CANNOT BE MAINTAINED, INSTALL ADDITIONAL RIVETS A/R PER SRM MAINTAINING 2D MIN EDGE DISTANCE. (REF. L-1011 SRM 51-40-00).

VIEW (F)

NUMBER 2 ENGINE FUEL FEED LINE ALIGNMENT

ASSURE FUEL LINE IS NOT PRELOADED FROM CLAMP LOCATIONS. REALIGN CLAMPS A/R


AFTER INSTALLING CLAMPS DRILL NEW SUPPORT CLIP USING EXISTING RIVET HOLES AS GUIDE (TYPE 4 PLACES)
SHIM CLAMP AS REQUIRED USING AN960-3 WASHER (A/R)
EXISTING CLAMP AND ATTACHING PARTS
FS 1898.47 REF. L-1011 DWG 1522874
NO. 2 ENGINE FUEL FEED LINE (TYP)
ATTACH SUPPORT CLIP USING BACR15BB3AD-( ) OR EQUIVALENT (TYP 4 PLACES)

OPTIONAL:
DRILL 3 OVERSIZE HOLES, USING EXISTING HOLES AS A GUIDE

DRILL OVERSIZE HOLES PER SRM 51-40-00

VIEW (G)

NOTE

FABRICATE NEW SUPPORT CLIP 2024T3 EXCEPT ADD 0.37 TO LENGTH

OPTIONAL:
ATTACH SUPPORT CLIP USING 3 BACR15BB4DD-( ) RIVETS OR EQUIVALENT. PLUG ORIGINAL RIVET HOLE A/R

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CR CR No. 2 Engine Fuel Line Clearance Check/Repair
Figure 801 (Sheet 4)

R EFFECTIVITY: ALL
R
001B

R R ENGINE NO. 1 AND NO. 3 FUEL LINE BREAKAWAY FITTING REMOVAL AND INSTALLATION

R 1. Equipment and Materials

R Methyl-Ethyl-Ketone (MEK), Fed. Spec. TT-M-261, or equivalent

R Dry, lint free cloths

R Brushes, Natural Bristle

R Sealing Compound, LCM40-2180 TYPE II (Products Research Co. PR R 7401K), or equivalent

R Container (approved for fuel), min 5 Gal

R 2. Referenced Procedures

R R	6-40-00	Exterior Access Doors and Removable Panels - Description and Operation
R	12-11-00	Fuel System Replenishing
R R	20-24-04	Electrical Bonding and Grounding Connections - Maintenance Practices
R R	20-51-02	Preparation For and Installation of Mechanical Fasteners
R	24-00-00	Electrical Power - Description and Operation
R	28-11-00	Tanks - Maintenance Practices
R	28-20-01	WIG-O-FLEX Couplings - Maintenance Practices
R	28-22-00	Defueling - Maintenance Practices
R	28-24-00	Engine Fuel Feed System - Adjustment and Test
R R	57-33-01	Outer Wing Box, Lower Access Doors - Removal and Installation
R	71-11-00	Cowlings, Engine No. 1 and No. 3 - Servicing
R	73-00-00	Engine Fuel and Control - Servicing

3. Removal/Installation

WARNING: VERIFY THAT AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF. 12-11-00 AND 28-11-00).

A. Removal

(1) Turn on electrical power (Ref. 24-00-00).

(2) On Flight Engineer/Second Officers FUEL SYSTEM panel zone 215, depress (unlatch) applicable ENG 1 or ENG 3 TANK VALVE switchlight. Verify that tank valve closes (flowbar light out, blue valve-in-transit light on, then out).

(3) Turn off electrical power (Ref. 24-00-00).

(4) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag the following circuit breakers:

ENG 1 - TANK VALVE or ENG 3 - TANK VALVE (T6 or T12)

ENG NO. 1 - EMER & L XFEED or ENG 3 - EMER & R XFEED (T7 or T13)

INBD BOOST PUMP - TANK 1 and 2L, or 3 and 2R (U7 and U8, or U9 and U10)

OUTBD BOOST PUMP 1 and 2L, or 3 and 2R (U13 and U3, or U14 and U4)

(5) Open left-hand hinged cowl, 413A or 423A for engines No. 1 or 3 (Ref. 71-11-00).

(6) Drain fuel from fuel supply line into a container by removing drain plug [Ref. Fig. 401 (Sheet 1)], zone 413 or 423 (Ref. 73-00-00). Reinstall drain plug and lock-wire.

(7) Open wing leading edge access panels 511LB and 611LB (Ref. 6-40-00).

(8) Disconnect engine fuel supply line from fuel line fitting by removing coupling [Ref. 28-20-01 and Fig. 402 (Sheet 1)]. Retain coupling and discard packing.

(9) Close circuit breakers opened in Step 3A(4).

(10) Turn on electric power (Ref. 24-00-00).

(11) Defuel tank No. 1 or No. 3 (Ref. 28-22-00).

(12) Turn off electric power (Ref. 24-00-00).

(13) Open and tag circuit breakers called out in Step 3A(4).

(14) Purge and ventilate Tank No. 1 or No. 3 (Ref. 28-11-00).

WARNING: FUEL TANKS CONTAIN EXPLOSIVE VAPOR. THEREFORE, OBSERVE ALL APPLICABLE SAFETY REQUIREMENTS AS SPECIFIED IN 28-11-00.

BEFORE ENTERING FUEL TANKS, VERIFY THAT ADEQUATE FLOW OF VENTILATING AIR IS BEING SUPPLIED TO THE TANK (REF. 28-11-00).

(15) Remove wing access cover plate 531FB or 631FB (Ref. 6-40-00 and 57-33-01).

(16) Remove fuel line fitting coupling at tank fuel shutoff valve [Ref. 28-20-01 and Fig. 401 (Sheet 1)].

(17) Remove sealant, eight bolts and washers, and fuel line fitting. Discard packing [Ref. Fig. 401 (Sheet 2)].

(18) Clean fuel line fitting installation area with TT-M-261 (MEK) Solvent and dry with a lint free cloth.

B. Installation

(1) Verify that circuit breakers opened in Step 3A(13) are opened and tagged.

(2) Ensure fuel line fitting faying surface is 100 percent electrically bonded to faying surface of adjacent structure and DC resistance value of 1.00 ohms is met (Ref. 20-24-04).

(3) Install packing and fuel line fitting with washers and bolts [Ref. 20-51-02 and Fig. 401 (Sheet 2)].

CAUTION: VERIFY THAT FUEL LINES ALIGN BEFORE INSTALLING COUPLING. MODIFY FUEL LINE SUPPORTS IF NECESSARY. DO NOT USE COUPLING TO FORCE ALIGNMENT.

(4) Install new packing and connect fuel line fitting to tank fuel shutoff valve with coupling [Ref. 28-20-01 and Fig. 401 (Sheet 1)].

(5) Brush coat entire area of tube fitting flange and peripheral with sealing compound (Ref. 28-11-00).

NOTE: Allow sufficient time for sealant to cure. Accelerated cure time is possible by applying heat to rework area.

(6) Remove all tools and debris from work area.

(7) Install wing access cover plate 531FB or 631FB (Ref. 6-40-00 and 57-33-01).

CAUTION: VERIFY THAT FUEL LINES ALIGN BEFORE INSTALLING COUPLING. MODIFY FUEL LINE SUPPORTS IF NECESSARY. DO NOT USE COUPLING TO FORCE ALIGNMENT.

(8) Install new packing and connect engine fuel supply line to fuel line fitting with coupling (Ref. 28-20-01).

(9) Fill void between wing spar and tube with sealing compound [Ref. Fig. 401 (Sheet 2)].

(10) Remove tags and close circuit breakers opened in Step 3B(1).

(11) Open tank valve closed in Step 3A(1) thru 3A(3).

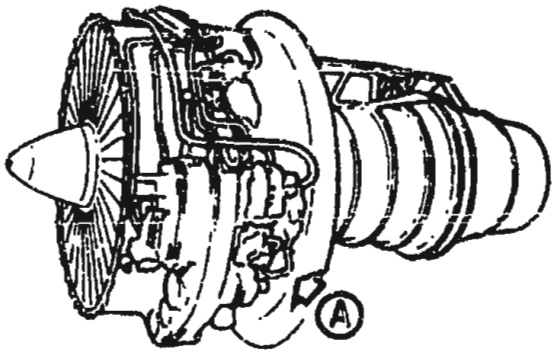
(12) Refuel tank No. 1 or No. 3 (Ref. 12-11-00).

(13) Inspect access coverplate 531FB or 631FB for leaks (Ref. 28-11-00).

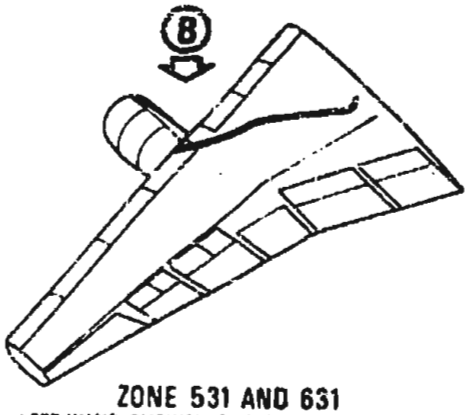
R (14) Perform operational test of applicable tank valve (Ref. 28-24-00) and check for fuel leaks (Ref. Fig. 401).

(15) Close access panel 511LB or 611LB opened in Step 3A(7).

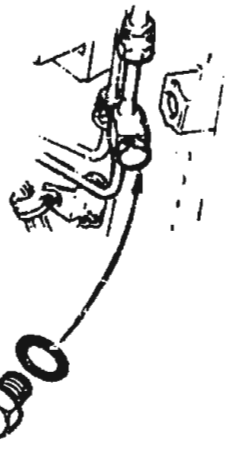
(16) Close left-hand hinged cowl 413A or 423A opened in Step 3A(5).



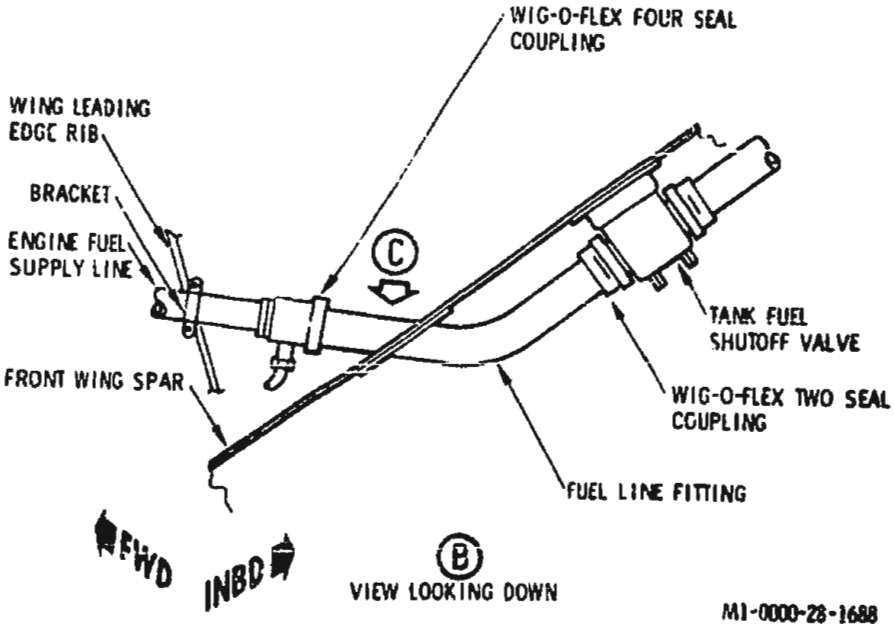
ENGINE 1 OR 3



ZONE 531 AND 631
LEFT WING SHOWN, RIGHT WING OPPOSITE



DRAIN PLUG
FUEL SUPPLY LINE DRAIN
A



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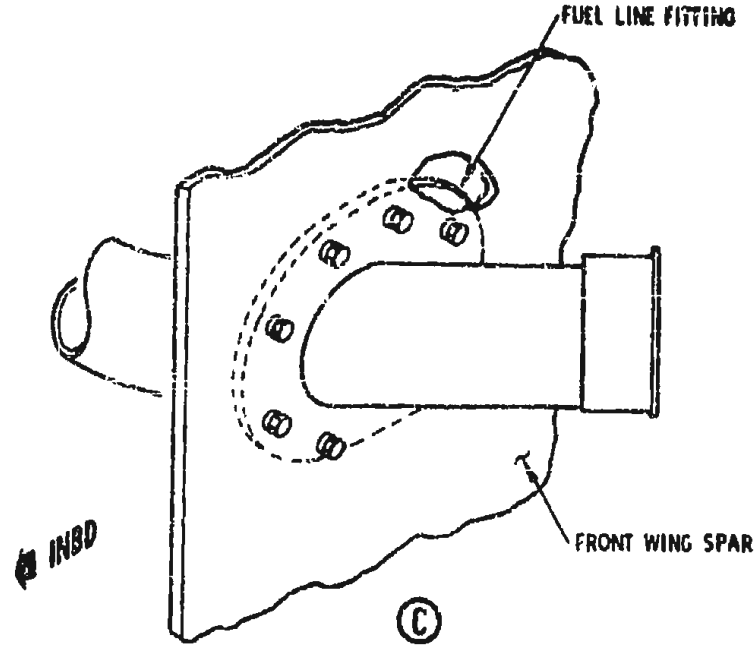
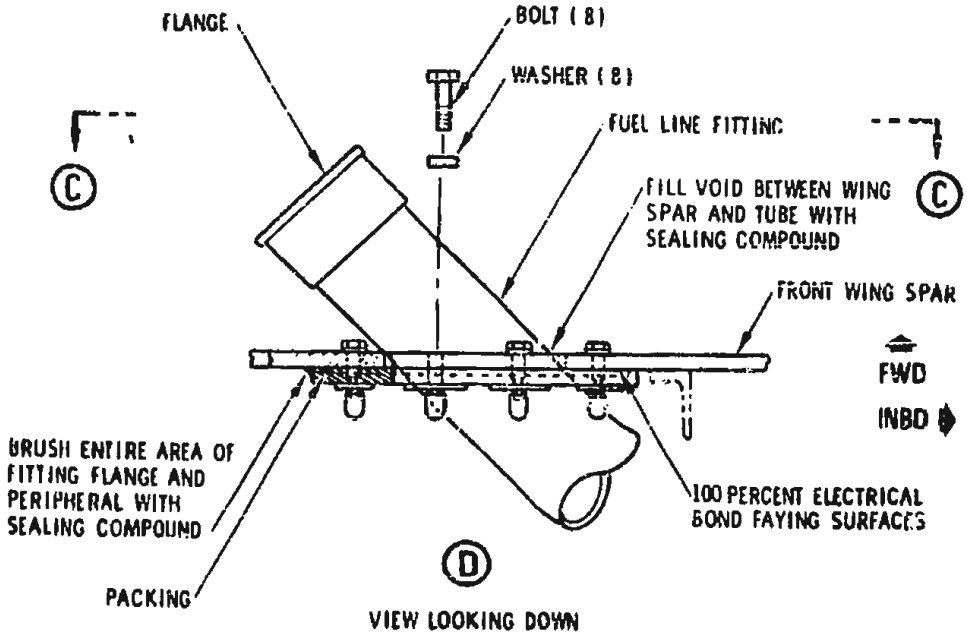
R Fuel Line Fitting - Removal and Installation
R Figure 401 (Sheet 1)

R EFFECTIVITY: ALL
R
001B



VIEW LOOKING AFT
(ROTATED 180°)



VIEW LOOKING DOWN

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R Fuel Line Fitting - Removal and Installation
R Figure 401 (Sheet 2)

R EFFECTIVITY: ALL
R
001B

AUXILIARY POWER UNIT (APU) FUEL SUPPLY SYSTEM DESCRIPTION AND OPERATION

1. General

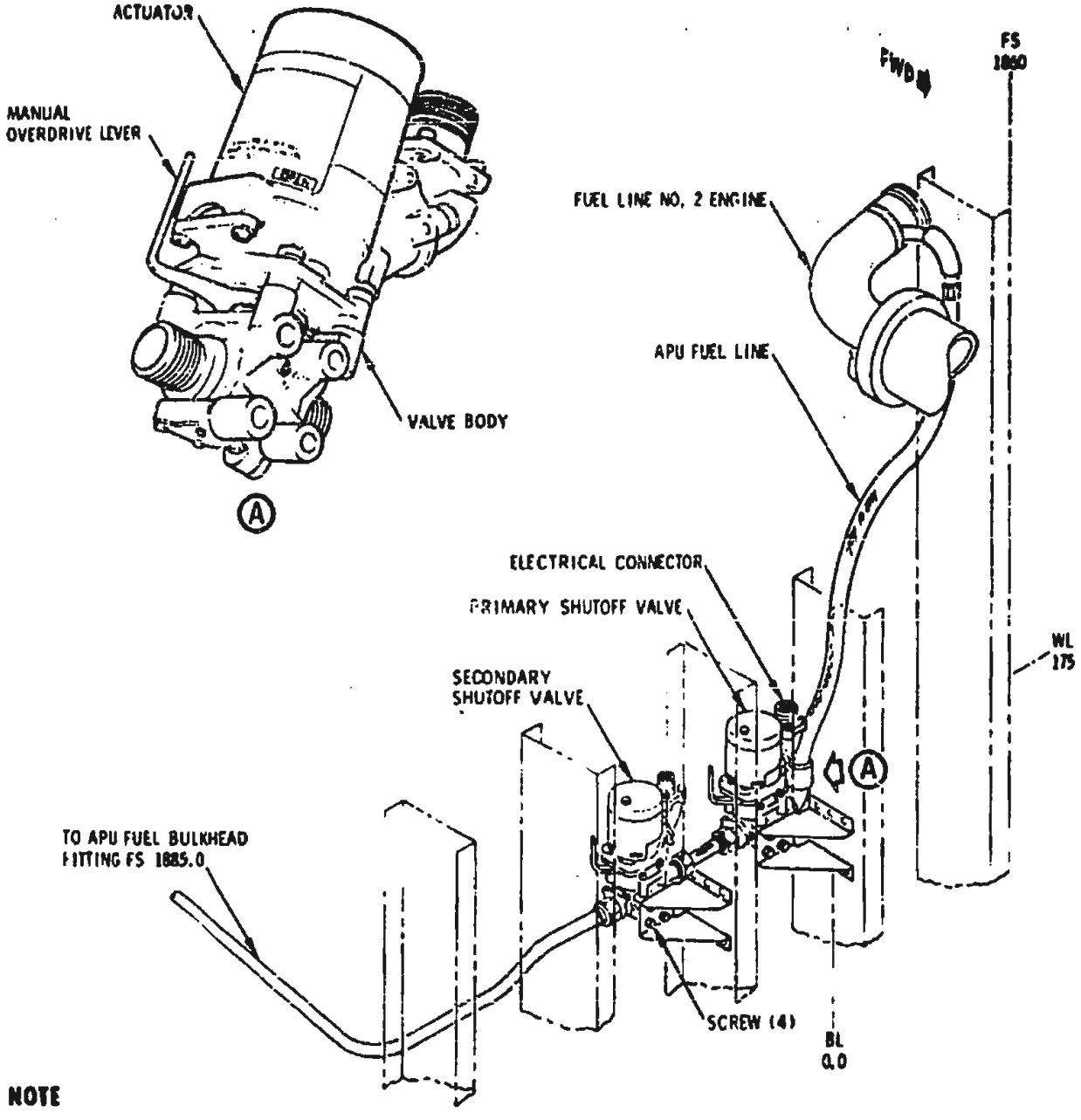
Fuel is supplied to the APU through a flexible hose connected to a fitting in the No. 2 engine fuel feed line just aft of the cabin pressure bulkhead and two electrically operated emergency (primary and secondary) fuel shutoff valves (Ref. Fig. 1). The primary emergency fuel shutoff valve is normally closed and isolates the fuel supply source from the APU when it is not in operation. It is electrically opened when APU master power is applied. The secondary emergency fuel shutoff valve is normally open. It serves as a redundant (backup) fuel shutoff valve, operating in conjunction with the primary fuel shutoff valve to isolate the APU fuel source in emergency situations. Both valves are electrically closed by actuation of the fire pull handles on the Flight Engineer/Second Officers lower panel or on the APU external control panel. Both valves may also be manually operated if required during ground maintenance. Maintenance personnel, however, are cautioned that if the primary fuel shutoff valve is manually opened, it must be manually restored to the closed position to establish agreement between valve position and APU start control circuitry. The secondary fuel shutoff valve, if left manually closed, will result in an APU EMERGENCY SHUTOFF SEC disagreement light on the Flight Engineer/Second Officers FUEL SYSTEM panel when APU master power is applied. An APU start, however, will not be inhibited as the valve is electrically opened when the APU START switch is depressed.

Since APU fuel is drawn from the No. 2 engine fuel feed line, the ENG 2 TANK VALVE must be open whenever the APU is operated. This valve is controlled by the ENG 2 TANK VALVE switchlight on the Flight Engineer/Second Officers FUEL SYSTEM panel (Ref. 28-24-00).

From the outlet port of the secondary fuel shutoff valve, fuel is routed to a fitting on the forward bulkhead of the APU compartment. A flexible hose (supplied with the APU) feeds fuel from the bulkhead fitting to the APU fuel inlet port on the oil-to-fuel heater located on the engine accessory gearbox (Ref. 49-31-00).

2. Operation

For details of APU fuel system refer to Chapter 49-31-00.



NOTE

ACTUATOR MAY BE REPLACED WITHOUT REMOVING VALVE BODY

MI-0001-28-321

R
R

APU Fuel Supply System
Figure 1

EFFECTIVITY: ALL

002B

APU BOOST PUMP HOUSING - REMOVAL AND INSTALLATION

1. General

The APU boost pump assembly is located just outboard of the No. 3 engine fuel system boost pumps. The assembly consists of a fuel pump and motor (plug-in element) and a canister type housing. The pump housing is mounted inside the tank on the lower wing skin surface.

2. Equipment and Materials

Air vacuum cleaner

Container, 1 gallon

Methyl-Ethyl-Ketone, Fed Spec TTT-M-261, or equivalent

Packing

Rags, Wiping Cotton, Fed Spec DDD-R-30, or equivalent

Sealing Compound, LAC Spec LCM 40-1218, Type I (fillet sealing), or equivalent

Sealing Compound, LAC Spec LCM 40-2121 (faying surface sealing), or equivalent

3. Referenced Procedures

6-40-00	Exterior Access Door and Panels
12-11-00	Fuel Tank Replenishing
24-41-00	External Power/Ground Service System - Maintenance Practices
28-11-00	Tanks - Maintenance Practices
28-11-00	Tanks - Approved Repairs
28-22-00	Defueling System - Maintenance Practices
28-25-00	APU Boost Pump Plug-in Assembly - Removal and Installation
57-31-01	Outer Wing Box, Lower Access Doors - Removal and Installation

4. Removal/Installation

A. Removal

(1) Defuel tank No. 3 (Ref. 28-22-00).

(2) Remove right wing lower access cover 641AB (Ref. 6-40-00).

(3) Purge tank No. 3 (Ref. 28-11-00 Maintenance Practices).

(4) On Flight Engineers/Second Officers aft circuit breaker panel CB3, zone 215, open and tag circuit breaker APU BAT BUS - TANK VALVE & PUMP (S14).

(5) At terminal board TB1, located on wing rear beam, disconnect and tag APU boost pump wiring. Tie wires together and attach a pull-string approximately 10 feet long. Secure end of string at convienent point.

(6) Disconnect conduit coupling nut at upper end of APU boost pump housing (Ref. Fig. 401).

(7) Pull pump electrical wires and pull-string from conduit.

(8) Disconnect fuel line at pump housing.

(9) Remove sealing compound fillet at base of pump.

(10) Remove APU boost pump cover plate 631CB (Ref. 57-31-00).

(11) Remove APU pump plug-in assembly (Ref. 28-25-02). Use container to catch draining fuel.

(12) Remove boost pump housing attach screws and remove housing from aircraft.

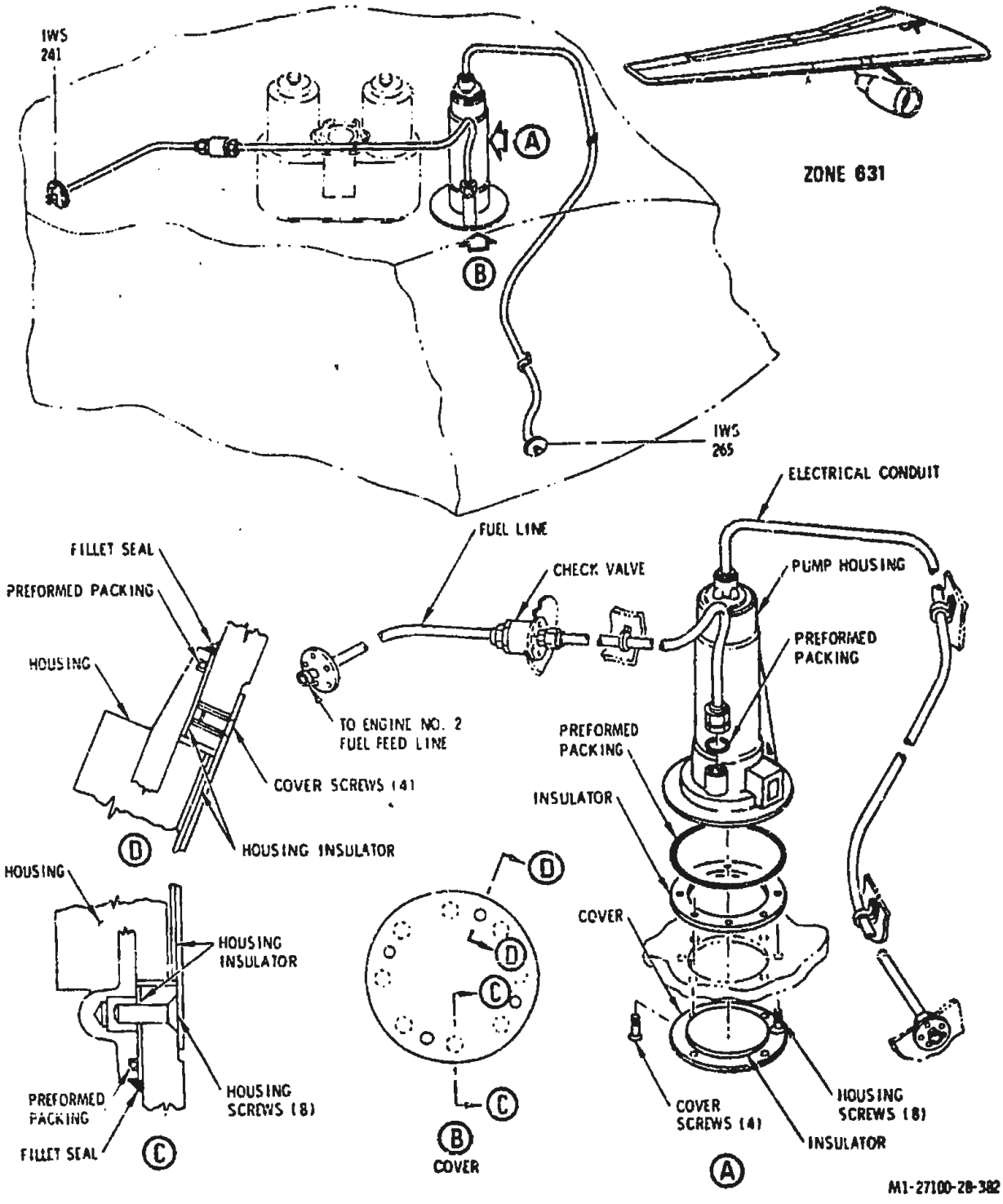
(13) Thoroughly clean sealant from wing inner surface at base of pump and isolator.

(14) Clean wing skin area of all loose sealant and contaminants (Ref. 28-11-00 Approved Repairs).

B. Installation

(1) Verify that circuit breaker opened in Step 4A(4) is open and tagged.

(2) Clean faying surface of replacement APU boost pump to ensure positive electrical bond (Ref. Fig. 401).



APU Boost Pump Housing - Removal and Installation
Figure 401

(3) Place new packing in faying surface groove of pump.

(4) Place isolator on lower surface of pump.

(5) Apply sealing compound, LAC Spec LCM 40-2121, or equivalent, to faying surfaces of wing skin and isolator. Use sealing compound sparingly to ensure that compound does not squeeze out into threads of attaching screws or into inserts (Ref. 28-11-00).

(6) Position pump on wing skin and align attaching holes in skin, isolator, and pump.

NOTE: The tube connection fitting on pump is on inboard side.

(7) Install attaching screws. Screws must be free of sealant to ensure metal-to-metal contact with skin.

(8) Apply a fillet of sealing compound, LAC Spec LCM 40-1218, Type I, or equivalent, inside tank around base of pump.

NOTE: Sealing compound must cure for 8 hours at 75 degrees Fahrenheit.

(9) Connect fuel line to fitting on pump.

(10) Using pull-string, pull pump electrical wires through conduit. Remove pull-string and connect wires to terminal board TB1 on rear wing beam.

(11) Connect electrical conduit to APU pump housing.

(12) Check that area is free of all contaminants.

(13) Reinstall tank access door 631AB (Ref. 57-31-01).

(14) Close access door 641AB.

(15) Install access coverplate 631CB over boost pump.

(16) Refuel the No. 3 tank (Ref. 12-11-00).

(17) Turn on electrical power (Ref. 24-41-00).

(18) Remove tag and close circuit breaker opened in Step 4A(4).

(19) On Flight Engineer/Second Officers APU CONTROL panel, place MASTER POWER switch in ON position.

(20) On Flight Engineer/Second Officers FUEL SYSTEM control panel, depress APU boost pump switchlight. Verify the following results:

(a) APU boost pump LOW light goes out.

(b) APU boost pump and APU TANK VALVE flowbar lights come on.

(c) APU TANK VALVE disagreement light comes on, then goes out.

(d) LOW FUEL PRESSURE light on APU CONTROL panel goes out.

(21) Depress and unlatch APU pump and ENG 2 TANK VALVE switchlights.

(22) Place MASTER POWER switch on APU control panel in OFF position.

(23) Turn off electrical power (Ref. 24-41-01).

CROSSFEED SYSTEM - DESCRIPTION AND OPERATION

1. General

The crossfeed system permits any engine feed tank to supply fuel to any engine; however, fuel cannot be transferred from tank to tank through this system. Three crossfeed valves control the system in conjunction with the tank shutoff valves. The crossfeed manifold and valves are located on the rear beam in the hydraulic service center. The manifold tees into the engine No. 1 and 3 feed line between the boost pumps and the tank shutoff valves and into the engine No. 2 feed line between the fuel flow equalizer and the shutoff valve (Ref. Fig. 1).

Power from the 28V dc bus is supplied through the engine emergency and crossfeed circuit breaker, zone 215, and connects the CROSSFEED VALVES switchlight to the corresponding valve. The three switchlights that control the crossfeed subsystem are on the Flight Engineer/Second Officers FUEL SYSTEM panel, zone 215. When a switchlight is depressed to open a particular crossfeed valve, the light comes on illuminating the flow bar on that switchlight lens. If the valve is not in the position selected by the switchlight, a disagreement signal from the valve causes a separate light to come on, illuminating the blank side of the switchlight lens.

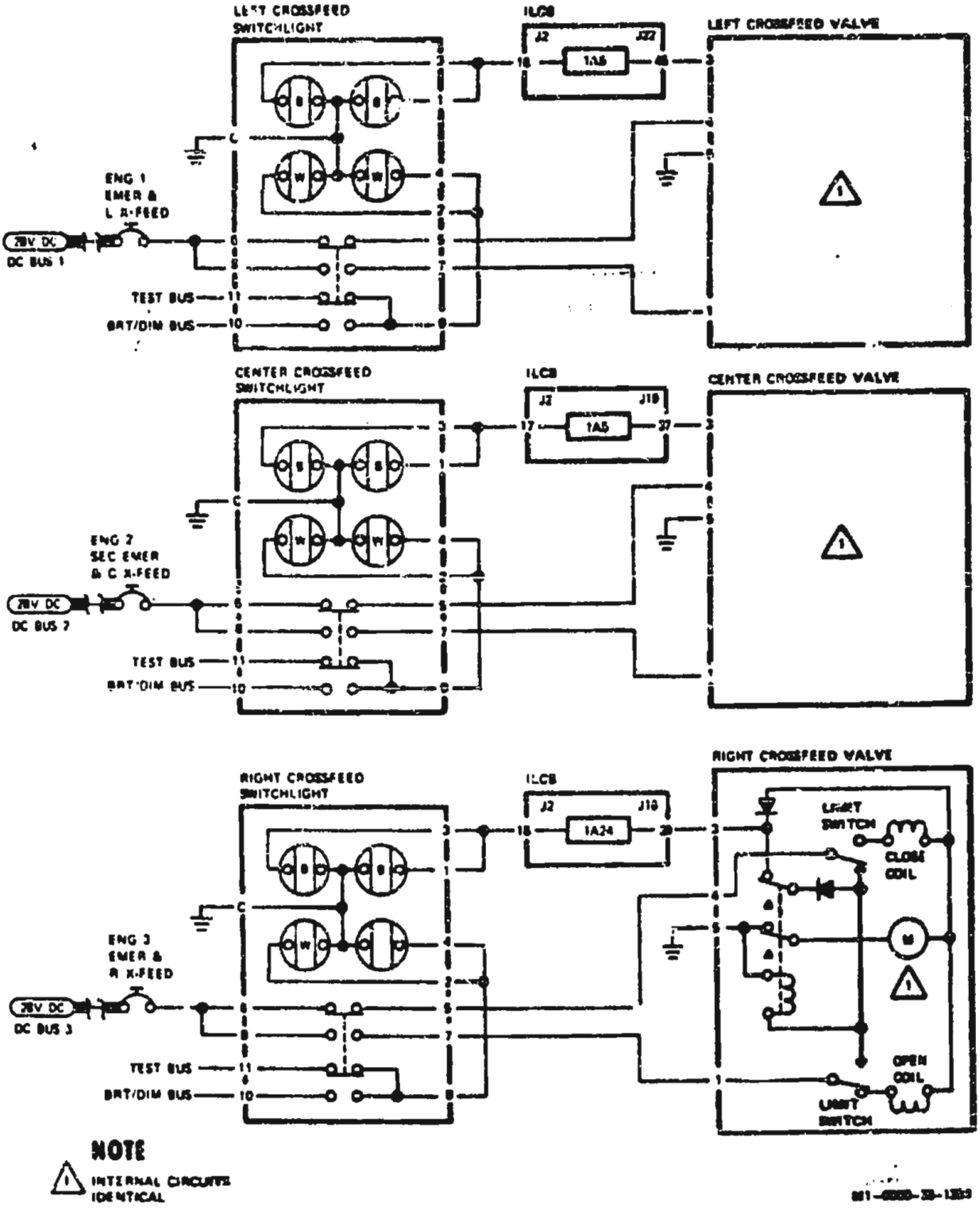
2. Dual Plug-in-Type Shutoff Valve - Crossfeed

A. Description and Operation

The crossfeed dual plug-in type shutoff valve (Ref. Fig. 2) consists of three major components: a housing assembly, which includes secondary seals and shutoff sleeve element: a shutoff valve plug-in assembly, which includes the primary shutoff seals and rotating cylindrical plug; and the electric motorized actuator. The actuator is removable as a unit, with the plug-in unit or separately.

The primary valving element is a rotating cylindrical plug, cross-drilled for the open flow passage. Closed-valve thermal-pressure relief provision is included. The primary port seals are Teflon with a metal-reinforced molded elastomeric insert. The valve shaft seal is a Teflon-jacketed O-ring assembly.

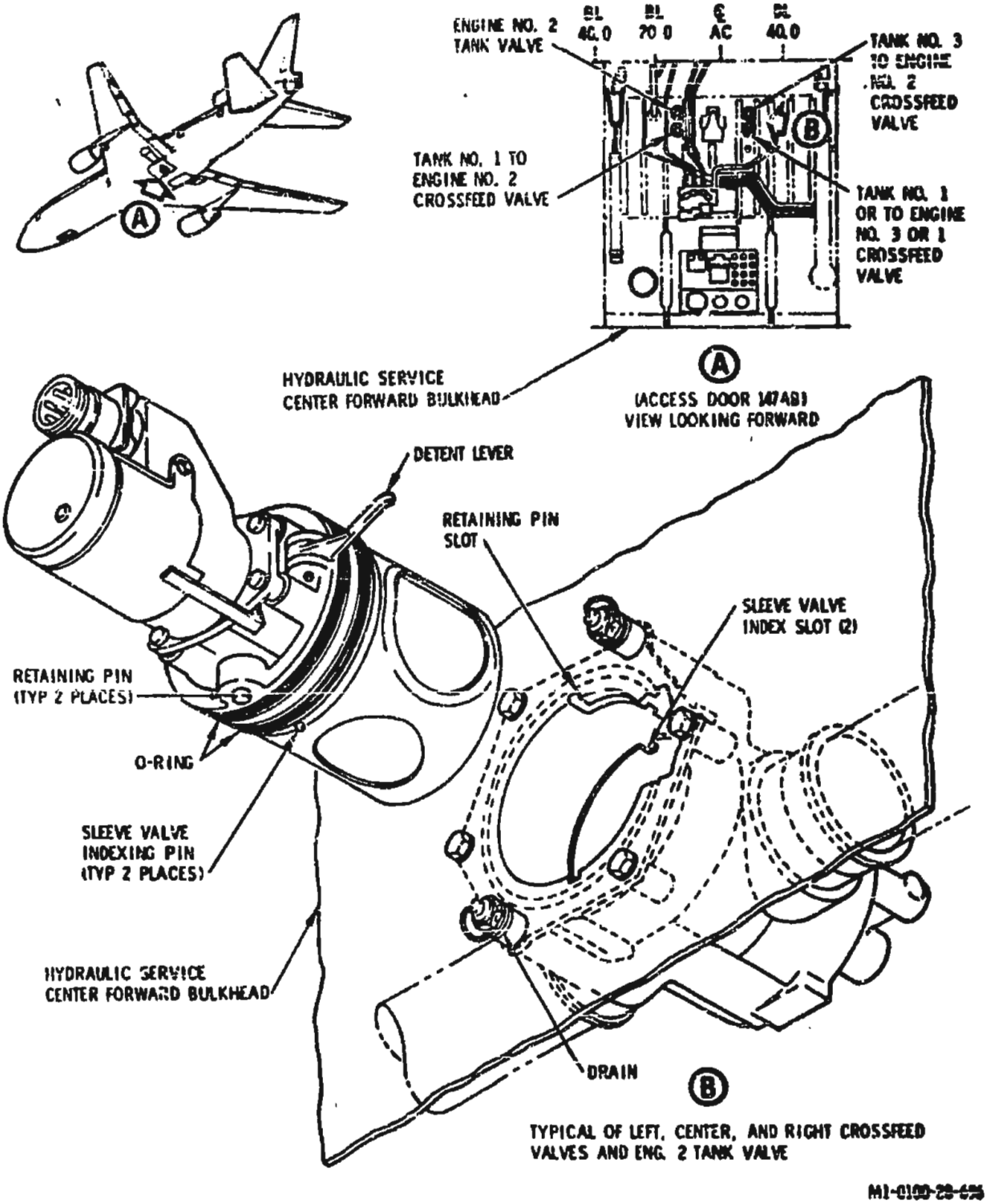
The secondary sealing element, functional when the valve plug-in assembly is removed, is a rotating sleeve, cross-drilled for the open-valve flow path and slotted for indexing to the actuator plug-in assembly. The secondary



R Fuel Crossfeed Schematic
R Figure 1

port seals are molded elastomeric inserts in a metal retainer.

The valve plug-in assembly can be removed without disturbing the valve housing assembly. Valve plug-in assembly removal automatically closes the secondary shutoff element in the housing assembly, sealing off both line openings into the valve housing.


ENGINE NO. 2 TANK VALVE
BL 40.0
BL 70.0
℄ AC
BL 40.0
TANK NO. 3 TO ENGINE NO. 2 CROSSFEED VALVE
TANK NO. 1 TO ENGINE NO. 2 CROSSFEED VALVE
TANK NO. 1 OR TO ENGINE NO. 3 OR 1 CROSSFEED VALVE
A
B
HYDRAULIC SERVICE CENTER FORWARD BULKHEAD
(ACCESS DOOR 147AB)
VIEW LOOKING FORWARD
DETENT LEVER
RETAINING PIN SLOT
SLEEVE VALVE INDEX SLOT (2)
RETAINING PIN (TYP 2 PLACES)
O-RING
SLEEVE VALVE INDEXING PIN (TYP 2 PLACES)
HYDRAULIC SERVICE CENTER FORWARD BULKHEAD
DRAIN
TYPICAL OF LEFT, CENTER, AND RIGHT CROSSFEED VALVES AND ENG. 2 TANK VALVE
M1-0100-28-626

Crossfeed Valve
Figure 2

CROSSFEED SYSTEM - FAULT ISOLATION

1. General

Reference data and fault isolation procedures for troubleshooting crossfeed system faults are included in this section of the manual. Crossfeed system malfunction detected by the flight crew is normally entered in the aircraft flight log book and reported to maintenance personnel by a FIRM fault code number. This number and the flight log book write-up can be found in the Chapter 28 Fault Code Index. The index specifies the maintenance manual section, fault isolation diagram figure number and, where approproate, a block number indicating the diagram entry point containing the fault isolation procedure. When no block number is specified, the diagram entry point is block 1.

Prerequisites listed at the top of each diagram identify mandatory preliminary steps and circuit breakers that must be closed before initiating any fault isolation step.

Schematic diagrams, identified by a SCHEM number, supplement fault isolation procedures as maintenance aids. The schematics show the basic system circuitry necessary for troubleshooting and include cross-reference indexes to the wiring diagram manual pages required for checking component interconnect wiring.

2. Fault Isolation

Table 101 is a list of fault isolation data in this section of the manual.

Fault Isolation Data
Table 101

	FIGURE NUMBER	TITLE
	101	Component Location Index
	102	Crossfeed Component Locator
R	103	Crossfeed System Fault Isolation
	SCHEM 1	Fuel Crossfeed Schematic

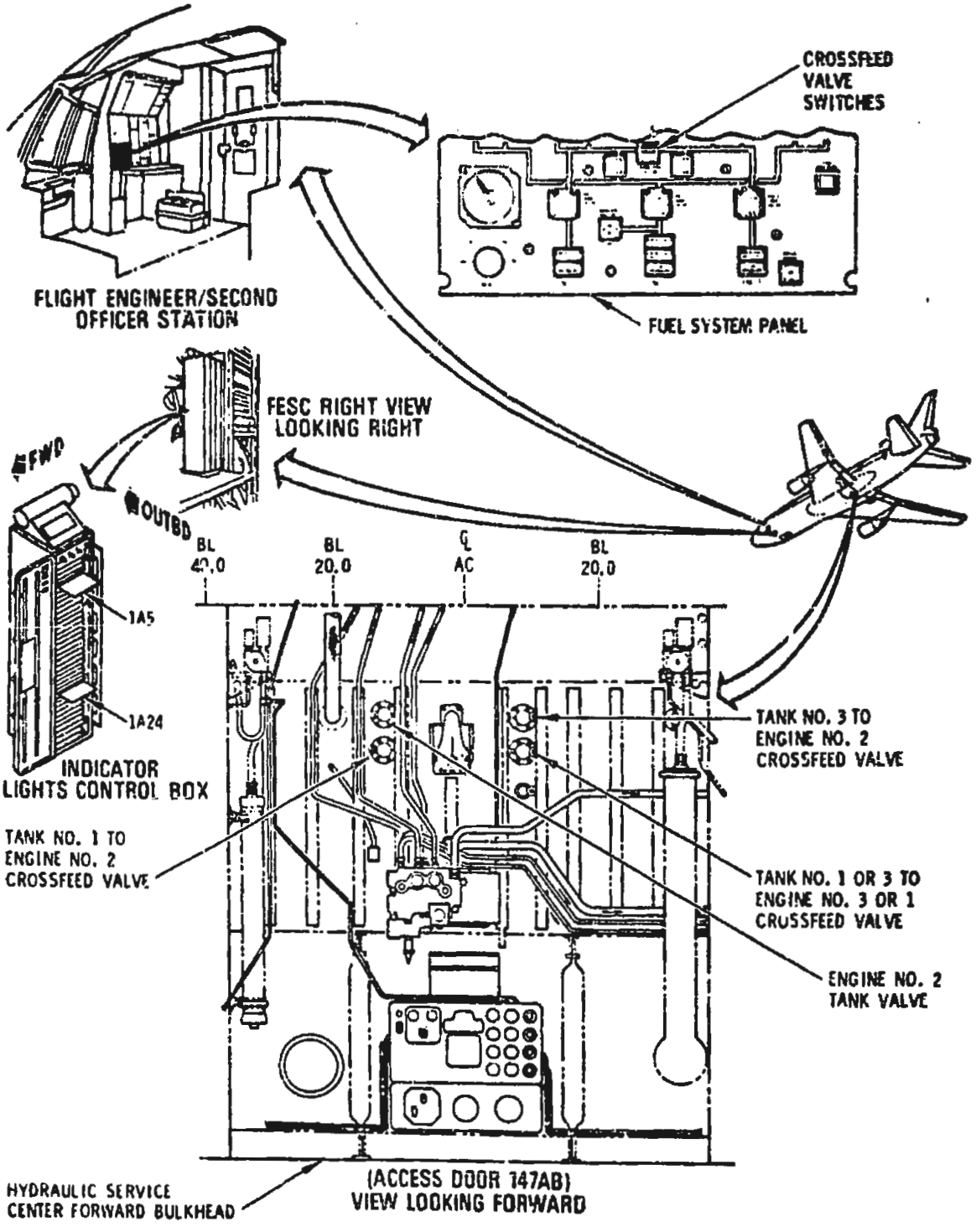
COMPONENT	QTY	AREA/ACCESS	REFERENCE
ACTUATOR - CROSSFEED VALVE	3	HSC/147AB	28-26-03
SWITCH - CROSSFEED VALVE	3	FE/SO PNL/FLT STA	20-33-01
VALVE - PLUG IN ASSEMBLY	3	HSC/147AB	28-26-02

M1-0000-28-1492

R Component Location Index
R Figure 101

EFFECTIVITY: ALL

0018

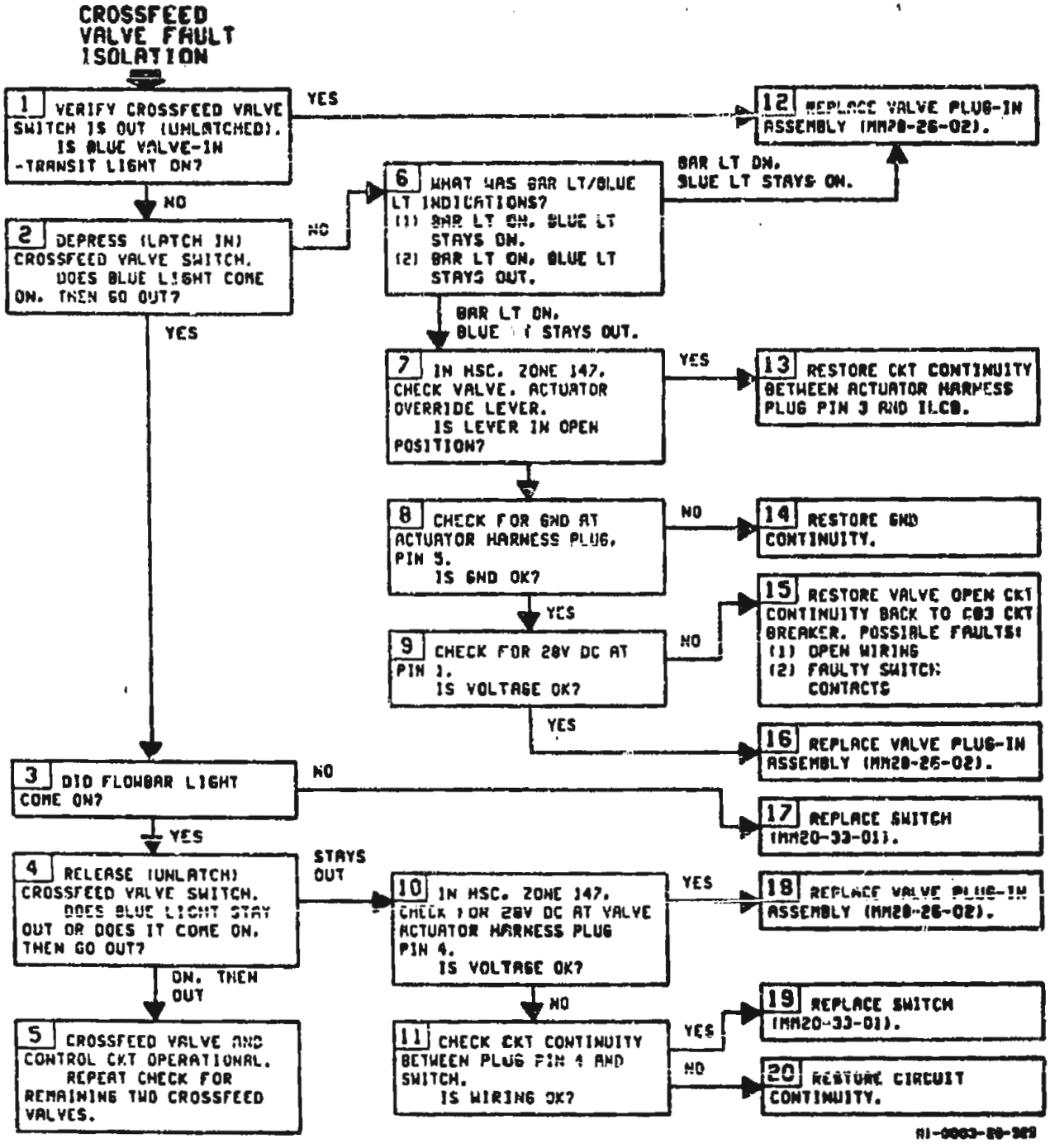

CROSSFEED VALVE SWITCHES
FLIGHT ENGINEER/SECOND OFFICER STATION
FUEL SYSTEM PANEL
FESC RIGHT VIEW LOOKING RIGHT
FWD
OUTBD
BL 40.0
BL 20.0
℄ AC
BL 20.0
1A5
1A24
INDICATOR LIGHTS CONTROL BOX
TANK NO. 3 TO ENGINE NO. 2 CROSSFEED VALVE
TANK NO. 1 TO ENGINE NO. 2 CROSSFEED VALVE
TANK NO. 1 OR 3 TO ENGINE NO. 3 OR 1 CROSSFEED VALVE
ENGINE NO. 2 TANK VALVE
HYDRAULIC SERVICE CENTER FORWARD BULKHEAD
(ACCESS DOOR 147AB) VIEW LOOKING FORWARD

M1-0001-28-626

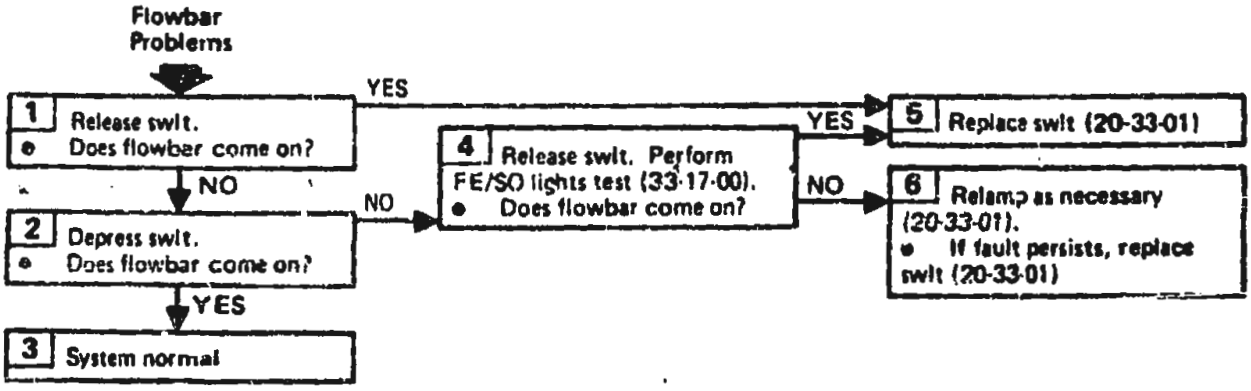
R Crossfeed System Component Locator
R Figure 102

R EFFECTIVITY: ALL
R
001B

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: C03-T7, T10, T13
CROSSFEED SWITCHES UNLATCHED (OUT)
REF: MM28-26-00 SCHEM 1
MM28-26-01, 05, 08


CROSSFEED VALVE FAULT ISOLATION
1 VERIFY CROSSFEED VALVE SWITCH IS OUT (UNLATCHED). IS BLUE VALVE-IN -TRANSIT LIGHT ON?
YES
12 REPLACE VALVE PLUG-IN ASSEMBLY (MM28-26-02).
NO
2 DEPRESS (LATCH IN) CROSSFEED VALVE SWITCH. DOES BLUE LIGHT COME ON, THEN GO OUT?
NO
6 WHAT WAS BAR LT/BLUE LT INDICATIONS? (1) BAR LT ON, BLUE LT STAYS ON. (2) BAR LT ON, BLUE LT STAYS OUT.
BAR LT ON, BLUE LT STAYS ON.
BAR LT ON, BLUE LT STAYS OUT.
YES
7 IN MSC, ZONE 147, CHECK VALVE, ACTUATOR OVERRIDE LEVER. IS LEVER IN OPEN POSITION?
YES
13 RESTORE CKT CONTINUITY BETWEEN ACTUATOR HARNESS PLUG PIN 3 AND ILC8.
8 CHECK FOR GND AT ACTUATOR HARNESS PLUG, PIN 5. IS GND OK?
NO
14 RESTORE GND CONTINUITY.
YES
9 CHECK FOR 28V DC AT PIN 1. IS VOLTAGE OK?
NO
15 RESTORE VALVE OPEN CKT CONTINUITY BACK TO C03 CKT BREAKER. POSSIBLE FAULTS: (1) OPEN WIRING (2) FAULTY SWITCH CONTACTS
YES
16 REPLACE VALVE PLUG-IN ASSEMBLY (MM28-26-02).
3 DID FLOWBAR LIGHT COME ON?
NO
17 REPLACE SWITCH (MM20-33-01).
YES
4 RELEASE (UNLATCH) CROSSFEED VALVE SWITCH. DOES BLUE LIGHT STAY OUT OR DOES IT COME ON, THEN GO OUT?
STAYS OUT
10 IN MSC, ZONE 147, CHECK FOR 28V DC AT VALVE ACTUATOR HARNESS PLUG PIN 4. IS VOLTAGE OK?
YES
18 REPLACE VALVE PLUG-IN ASSEMBLY (MM28-26-02).
ON, THEN OUT
5 CROSSFEED VALVE AND CONTROL CKT OPERATIONAL. REPEAT CHECK FOR REMAINING TWO CROSSFEED VALVES.
NO
11 CHECK CKT CONTINUITY BETWEEN PLUG PIN 4 AND SWITCH. IS WIRING OK?
YES
19 REPLACE SWITCH (MM20-33-01).
NO
20 RESTORE CIRCUIT CONTINUITY.

R Crossfeed System Fault Isolation
R Figure 103



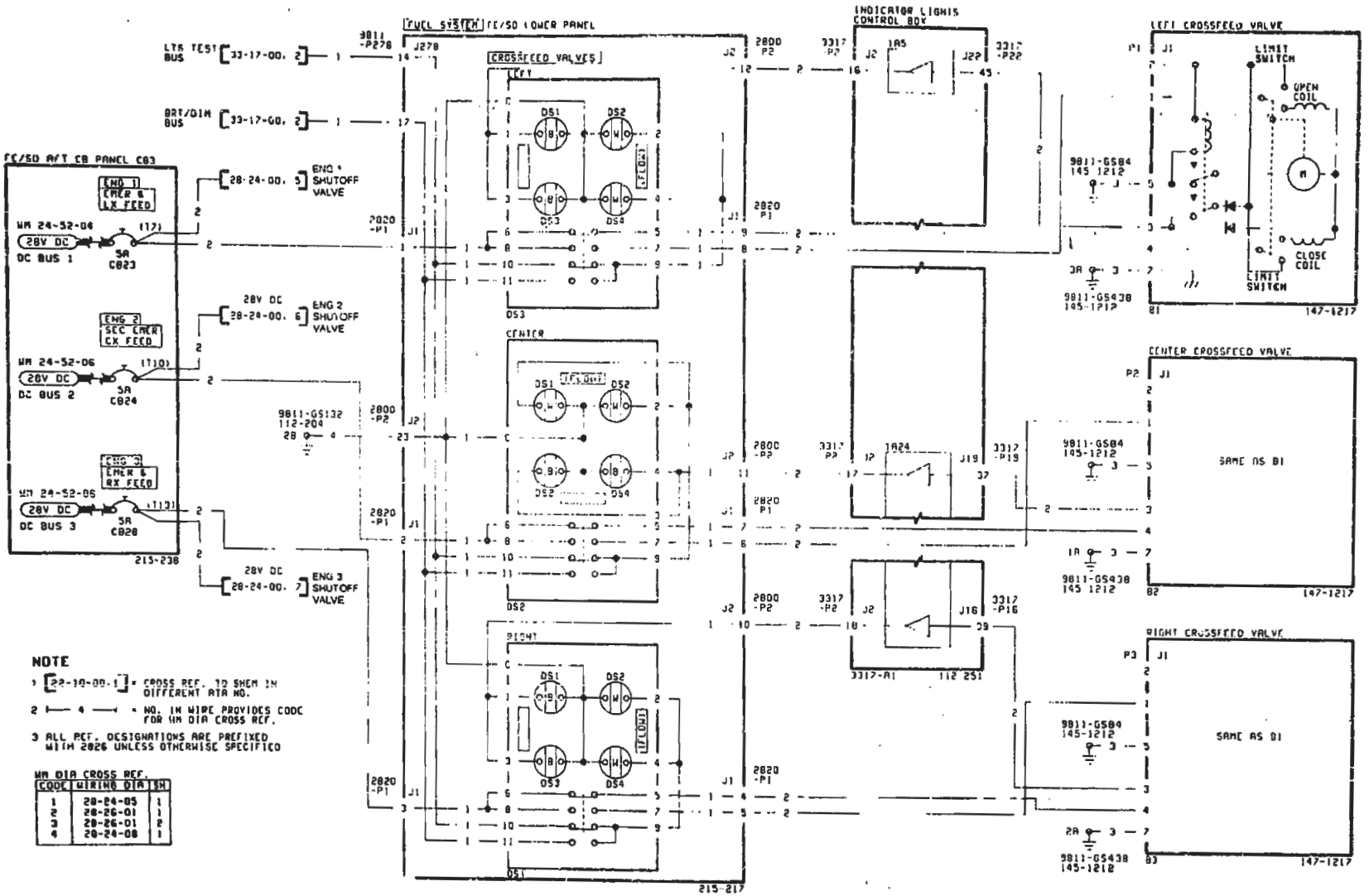
PREREQUISITES
Elec Pwr (24-00-00)
CB's: CB1-L9, CB2-J14

EM1-0100-28-526

R CROSS FEED VALVES Flow Bar Problems
R Figure 104

EFFECTIVITY: ALL

0018



NOTE

1 [22-10-00, 1] = CROSS REF. TO SHEM IN DIFFERENT ATA NO.

2 ⊢— 4 —⊣ = NO. IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.

3 ALL REF. DESIGNATIONS ARE PREFIXED WITH 2826 UNLESS OTHERWISE SPECIFIED

WM DIA CROSS REF.

CODE	WIRING DIA	SH
1	28-24-05	1
2	28-26-01	1
3	28-26-01	2
4	28-24-08	1

EM1-0005-28-373

R Fuel Crossfeed Schematic
R SCHEM 1

EFFECTIVITY: ALL

001B

CROSSFEED VALVE - MAINTENANCE PRACTICES

1. General

The following procedure specifies the method used to deactivate an inoperative fuel crossfeedvalve.

2. Deactivation

R NOTE: This deactivation procedure applies only when an aircraft
R is to be dispatched in accordance with the MEL.

A. Crossfeed Valve

(1) In the hydraulic service center, zone 147, disconnect the electrical harness connector on the applicable fuel crossfeed valve actuator.

(2) Install protective caps on the wiring harness connector and actuator receptacle. Stow connector.

(3) Move actuator override lever to the CLOSED position.

(4) Add placard to Flight Engineer/Second Officers FUEL SYSTEM panel, zone 215. Placard must specify which of the three crossfeed valves is inoperative.

(5) Make appropriate entry in aircraft log book.

CROSSFEED VALVE PLUG-IN ASSEMBLY - REMOVAL AND INSTALLATION

1. General

R Three fuel feed system crossfeed valves are mounted on the
R center section aft beam. Each valve consists of a housing
R containing a rotary sleeve secondary shutoff valve, an
R electrical actuator, and a plug-type primary shutoff valve. The
R actuator and primary shutoff valve may be replaced as an
R integral plug-in assembly. Rotation of the plug-in assembly,
R during removal, actuates the secondary shutoff valve to a
R position which shuts off the housing fuel inlet and outlet
R ports.

2. Equipment and Materials

R Preformed Packing (Ref. Figure 401)

Grease, Fluorosilicone, Dow Corning FS 1291, or equivalent

Drain pan (1 quart, minimum)

Lock-wire, Fed Spec QQ-W-390, 0.032-inch diameter, or equivalent

3. Referenced Procedure

24-00-00 Electrical Power System - Maintenance Practices

4. Removal/Installation

R CAUTION: VALVE ASSEMBLIES MODIFIED BY SB28-062 HAVE A GOLD
R ANODIZED SPACER PLATE ATTACHED TO THE VALVE ROTOR
R COVER ASSY THAT SUPPORTS THE ACTUATOR. THE PLATE
R PREVENTS INWARD MOVEMENT OF TWO VALVE RETAINING PINS
R INSTALLED IN THE COVER AND IS REQUIRED ONLY ON UNITS
R HAVING A RED ANODIZED COVER ASSY. WHEN REPLACING A
R PLUG-IN UNIT HAVING A RED ANODIZED COVER, BE SURE THAT
R THE REPLACEMENT UNIT IS EQUIPPED WITH THE SPACER
R PLATE.

R PLUG-IN UNITS HAVING A GOLD ANODIZED COVER ASSY HAVE
R STEPPED VALVE RETAINING PINS AND DO NOT REQUIRE THE
R SPACER PLATE.

A. Removal

CROSSFEED SYSTEM - ADJUSTMENT AND TEST

1. General

The three crossfeed valves are all of the same type and are located on the rear beam in the hydraulic service center, zone 147.

2. Referenced Procedure

24-41-00 External Power/Ground Service System - Maintenance Practices

3. Adjustment/Test

A. Operational Test

(1) Turn on electrical power (Ref. 24-41-00).

(2) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, verify that the following circuit breakers are closed:

R ENG 1 - EMER & LX FEED (T7)

R ENG 2 - SEC EMER CX FEED (T10)

R ENG 3 - EMER & RX FEED (T13)

R (3) On Flight Engineer/Second Officers FUEL SYSTEM panel, R depress each CROSS FEED VALVES switchlight, in turn, R and verify the following for each switchlight:

R (a) Flowbar comes on.

R (b) Blue disagreement light comes on (approximately R one second) and then goes off.

R (4) In the hydraulic service center, on forward bulkhead FS R 1212, verify that each crossfeed valve opens, as R indicated by position of the valve manual override arm.

R (5) Close the three crossfeed valves by releasing the R switchlights.

(6) Turn off electrical power (Ref. 24-41-00).

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, open and tag the following circuit breakers:

ENG 1 - EMER & LX FEED (T7)

ENG 2 - SEC EMER CX FEED (T10)

ENG 3 - EMER & RX FEED (T13)

(2) Enter hydraulic service center through access doors 147AB and locate crossfeed valve on wing center section aft beam.

(3) Disconnect electrical connector (Ref. Fig. 401).

(4) Place drain pan beneath crossfeed valve.

(5) Depress detent lever and rotate plug-in assembly 90 degrees counterclockwise.

(6) Remove drain screw from valve housing and drain fuel.

(7) Remove plug-in assembly from valve body by applying a steady pulling force.

(8) Reinstall drain screw finger tight.

B. Installation

(1) Verify that circuit breakers opened in Step 4A(1) are open and tagged.

R R R (2) Install new preformed packing on crossfeed valve plug-in assembly and lubricate with grease (Ref. Para. 2).

(3) Back off valve body drain screw.

(4) Align retaining pins with slots in valve body.

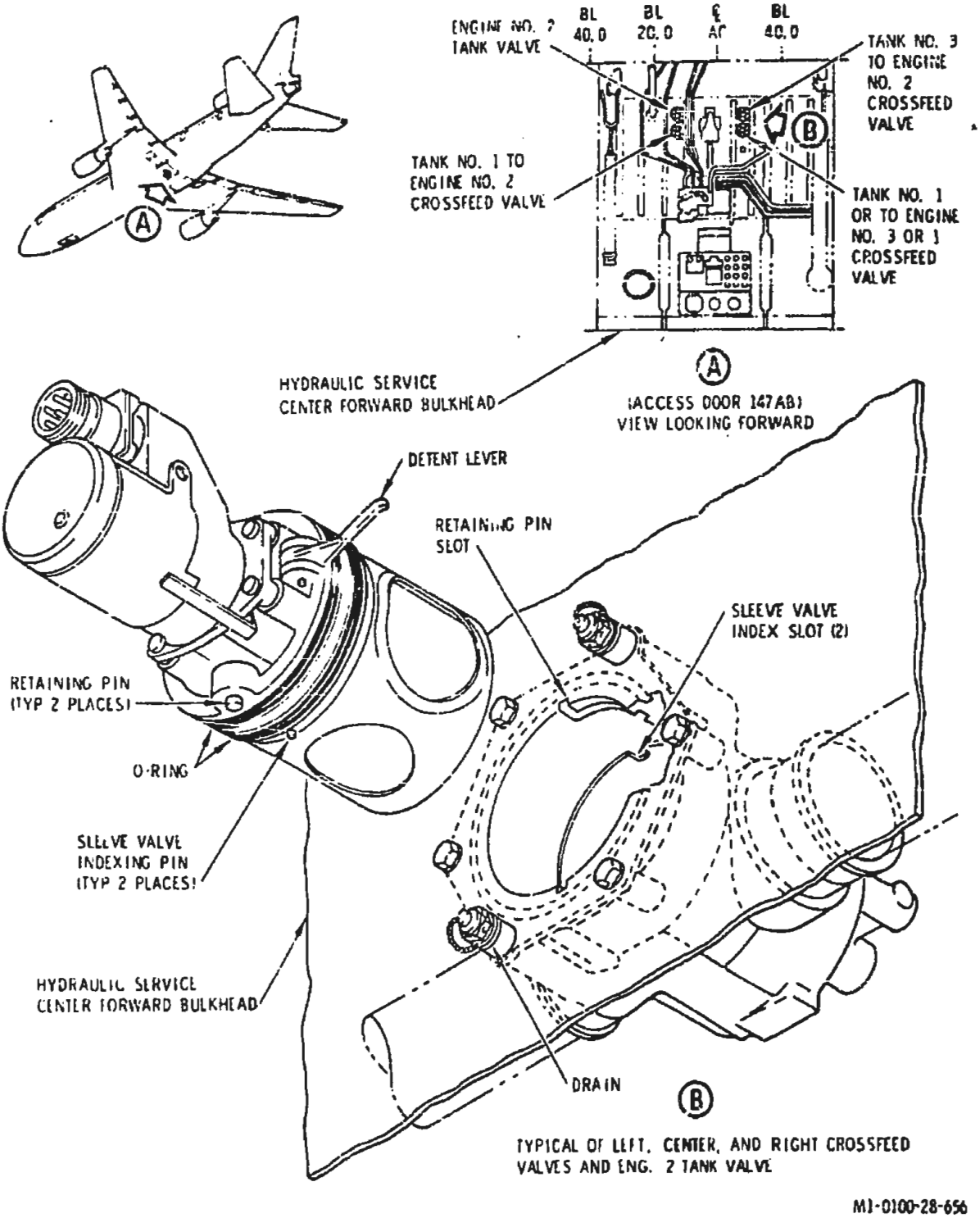
(5) Push plug-in assembly into valve body until it bottoms.

(6) Rotate plug-in assembly 90 degrees clockwise. Verify detent lever engages retaining slot in valve body.

(7) Tighten and lock-wire drain screw.

(8) Attach electrical connector and install lock-wire.

(9) Verify that valve override lever is in CLOSED position.


ENGINE NO. 2 TANK VALVE
BL 40.0
BL 20.0
℄ AC
BL 40.0
TANK NO. 3 TO ENGINE NO. 2 CROSSFEED VALVE
TANK NO. 1 TO ENGINE NO. 2 CROSSFEED VALVE
TANK NO. 1 OR TO ENGINE NO. 3 OR 1 CROSSFEED VALVE
A
B
HYDRAULIC SERVICE CENTER FORWARD BULKHEAD
(ACCESS DOOR 147AB) VIEW LOOKING FORWARD
DETENT LEVER
RETAINING PIN SLOT
SLEEVE VALVE INDEX SLOT (2)
RETAINING PIN (TYP 2 PLACES)
O-RING
SLEEVE VALVE INDEXING PIN (TYP 2 PLACES)
HYDRAULIC SERVICE CENTER FORWARD BULKHEAD
DRAIN
TYPICAL OF LEFT, CENTER, AND RIGHT CROSSFEED VALVES AND ENG. 2 TANK VALVE
MI-0100-28-656

Crossfeed Valve Plug-in Assembly - Removal and Installation
Figure 401

(10) Remove tags and close circuit breakers opened in Step 4A(1).

(11) Turn on external electrical power (Ref. 24-00-00).

R (12) Turn on applicable fuel feed boost pumps and do Steps
R (13) through (14) while installation is checked for
R fuel leakage.

R (13) On Flight Engineer/Second Officers Fuel System panel, depress CROSSFEED VALVE switchlight. Verify that switchlight flow bar comes on and blue valve-in-transit light comes on, then goes out.

NOTE: The flow bar light coming on indicates switch is in valve open position.

R (14) Check crossfeed valve manual override arm for
R indication of valve-open position.

R (15) Depress (unlatch CROSSFEED VALVE switchlight. Verify
R flowbar light goes out and blue valve-in-transit light
R comes on, then goes out.

R (16) Verify that crossfeed valve manual override lever is in
R CLOSED position.

R (17) Turn off electrical power (Ref. 24-00-00).

R (18) Close hydraulic service center access door.

CROSSFEED VALVE ACTUATOR - REMOVAL AND INSTALLATION

1. General

The removal and installation procedure described herein is applicable to all three crossfeed valves.

2. Equipment and Materials

Lock-wire, Fed Spec QQ-W-390, 0.032-inch diameter, or equivalent

3. Referenced Procedure

24-41-00 External Power/Ground Service System - Maintenance Practices

4. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, open and tag the following circuit breakers:

R ENG 1- EMER & LX FEED (T7).

R ENG 2 - SEL EMER CX FEED (T10).

R ENG 3 - EMER & RX FEED (T13)

R (2) Enter hydraulic service center through access doors
R 147AB and locate crossfeed valve on wing center section
R aft beam.

R (3) Disconnect electrical connector (Ref. Fig. 401).

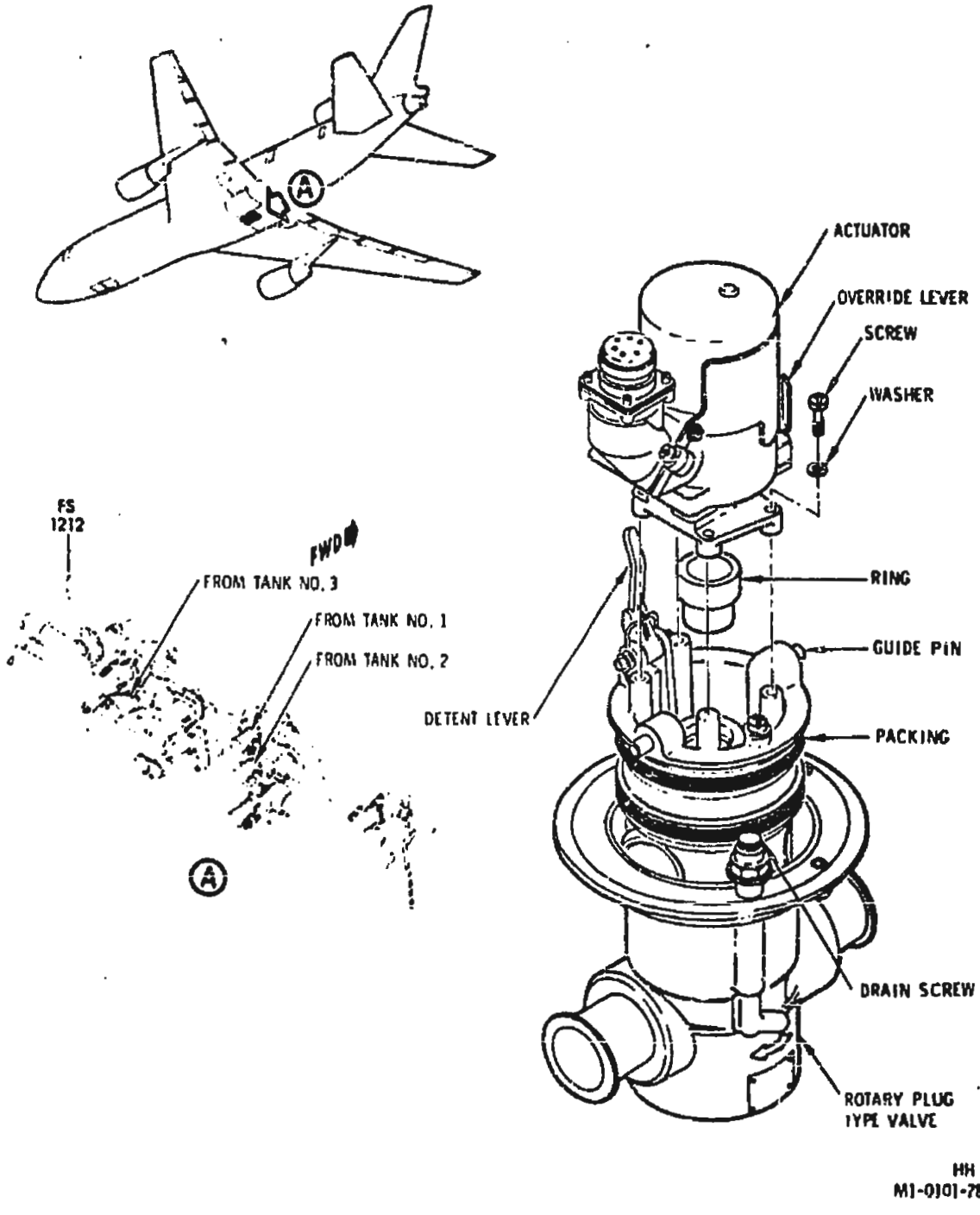
R (4) Remove actuator to valve attach screws.

(5) Remove actuator.

B. Installation

(1) Verify that circuit breakers opened in Step 4A(1) are open and tagged.

(2) Install actuator on valve (Ref. Fig. 401).



R Crossfeed Valve Actuator - Removal and Installation
R Figure 401

EFFECTIVITY: ALL

NOTE: Actuator will not mate with valve unless both are in open or closed position.

(3) Connect electrical connector to actuator and lock-wire.

(4) Remove tags and close circuit breakers opened in Step 4A(1).

(5) Turn on electrical power (Ref. 24-41-00).

(6) On Flight Engineer/Second Officers FUEL SYSTEM panel, depress CROSSFEED VALVES switchlight.

NOTE: The flow bar on switch light is an indication of switch position. Transit light comes on and goes out when valve has reached its selected position.

(7) In hydraulic service center check position of crossfeed valve manual override arm for open position.

(8) Depress CROSSFEED VALVES switchlight to OFF.

(9) Check that crossfeed valves override arm indicates valve is closed.

(10) Turn off electrical power (Ref. 24-41-00).

(11) Close access doors.

FUEL TRANSFER SYSTEM - DESCRIPTION AND OPERATION

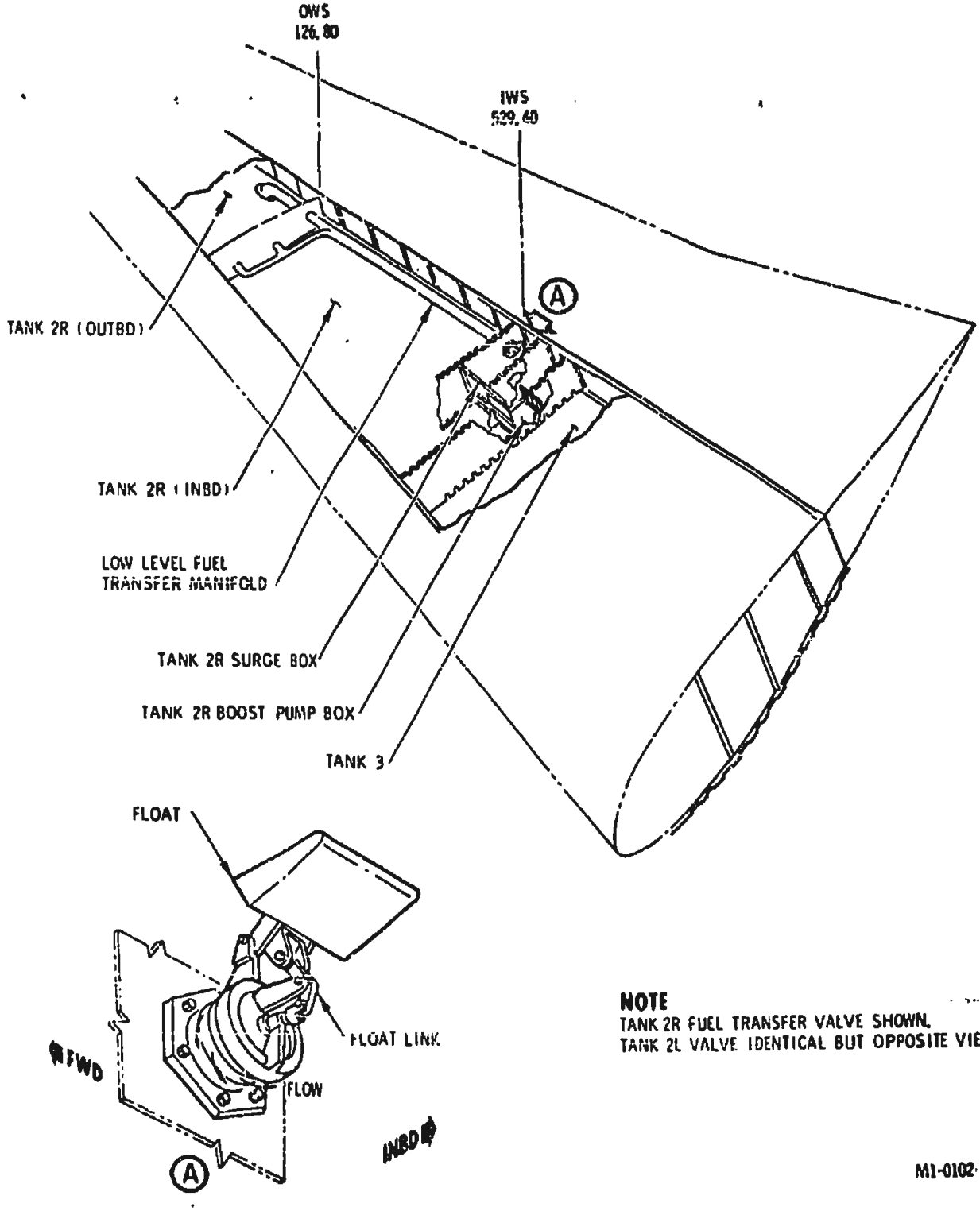
1. General

During flight, fuel is retained in the outboard section of tanks 2L and 2R until fuel in the inboard section has dropped to a level equivalent to approximately 1000 lbs (454 Kg). At that time, fuel in the outboard section is automatically transferred, by gravity flow, to the inboard section to replenish fuel drawn from the inboard section surge boxes by the No. 2 engine fuel feed system. Fuel transfer occurs through a manifold installed between the outboard compartment and a float-operated valve mounted on the tank divider rib.

2. Fuel Transfer Valve

A. Description and Operation

Tank 2L and 2R fuel transfer valves (Ref. Fig. 1) are float-operated units containing spring-loaded diaphragm-controlled fuel inlet ports. Lowering of the float with decreasing fuel level moves the diaphragm away from the inlet port and permits fuel flow through the unit. Conversely, a rising of the float reseats the diaphragm, and shuts-off the fuel flow. In operation, the flow of fuel through the valve is automatically modulated to maintain a minimum of approximately 1000 lb of fuel in the tank 2L/2R boost pump surge boxes.



NOTE
TANK 2R FUEL TRANSFER VALVE SHOWN.
TANK 2L VALVE IDENTICAL BUT OPPOSITE VIEW

M1-0102-28-102

R
R

Fuel Transfer Valve
Figure 1

EFFECTIVITY: 001-024, 027

FUEL TRANSFER SYSTEM - DESCRIPTION AND OPERATION

1. General

R Three separate fuel transfer systems affect fuel distribution and in-flight management of the fuel system. The first system, which is automatically controlled by float actuated fuel transfer valves, retains fuel in the tank 2L and 2R outboard sections until fuel in the companion inboard tank sections is depleted to approximately 1000 lbs (454 Kg). The second system uses jet ejector fuel pumps to transfer fuel from wing center section tanks 1A and 3A to the number 1 and 3 wing tanks.
R Motive fuel flow required for jet ejector pump operation is
R supplied by tank 1 and 3 fuel boost pumps through electrically
R operated fuel transfer valves controlled by switchlights on the
R FE/SO FUEL SYSTEM panel. This system operates in conjunction
R with a tank 1A/3A jet ejector pump operated fuel and condensate
R scavenge system which is automatically activated at takeoff and
R deactivated when 1A/3A fuel is being transferred (Ref.
R 28-10-00). The third system is a tank 1A/3A to tank 1/3 gravity
R flow transfer system comprised of two electrically actuated
R valves mounted on the center section tank beam at FS 1103,
R flapper type check valves at the tank interface ribs between the center section and adjacent wing tank, and gravity valve control switchlights on the FUEL SYSTEM panel. This system provides the FE/SO the option of directly connecting the center section and companion wing tanks in event the ejector pump operated fuel transfer system malfunctions. These valves are also automatically opened during fuel jettisoning (Ref. 28-27-00).

A. Tanks 2L and 2R Fuel Transfer

During flight, fuel is retained in the outboard section of tanks 2L and 2R until the fuel supply in the inboard section has dropped to a level equivalent to approximately 1000 lbs (454 kg). At that time, fuel in the outboard section is automatically transferred to the inboard section to replenish fuel drawn from the inboard section surge boxes by the No. 2 engine fuel feed system. Fuel transfer occurs through a manifold installed between the outboard compartment and a float-operated valve mounted on the tank divider rib.

B. Tank 1A and 3A Fuel Transfer (Fuel Ejector Pumps)

Fuel transfer from wing center section tanks 1A and 3A to wing tanks 1 and 3 is effected by three large (single nozzle) jet ejector scavenge pumps in each center section tank (Ref. Fig. 1, 3, and 5). One jet pump is mounted (in each tank) on the center section tank partition at fuselage

buttock station FBL-0. The remaining two pumps (in each tank) are mounted on the fuselage station FS 1163 center section beam that comprises the aft wall of each tank. Motive fuel flow for ejector pump operation is derived from the respective tank 1 and 3 fuel boost pumps through electrically actuated tank 1A and 3A fuel transfer valves mounted on the wing center section rear beam at fuselage station FS 1212. The actuators for these valves are accessible from the MLG wheel wells.

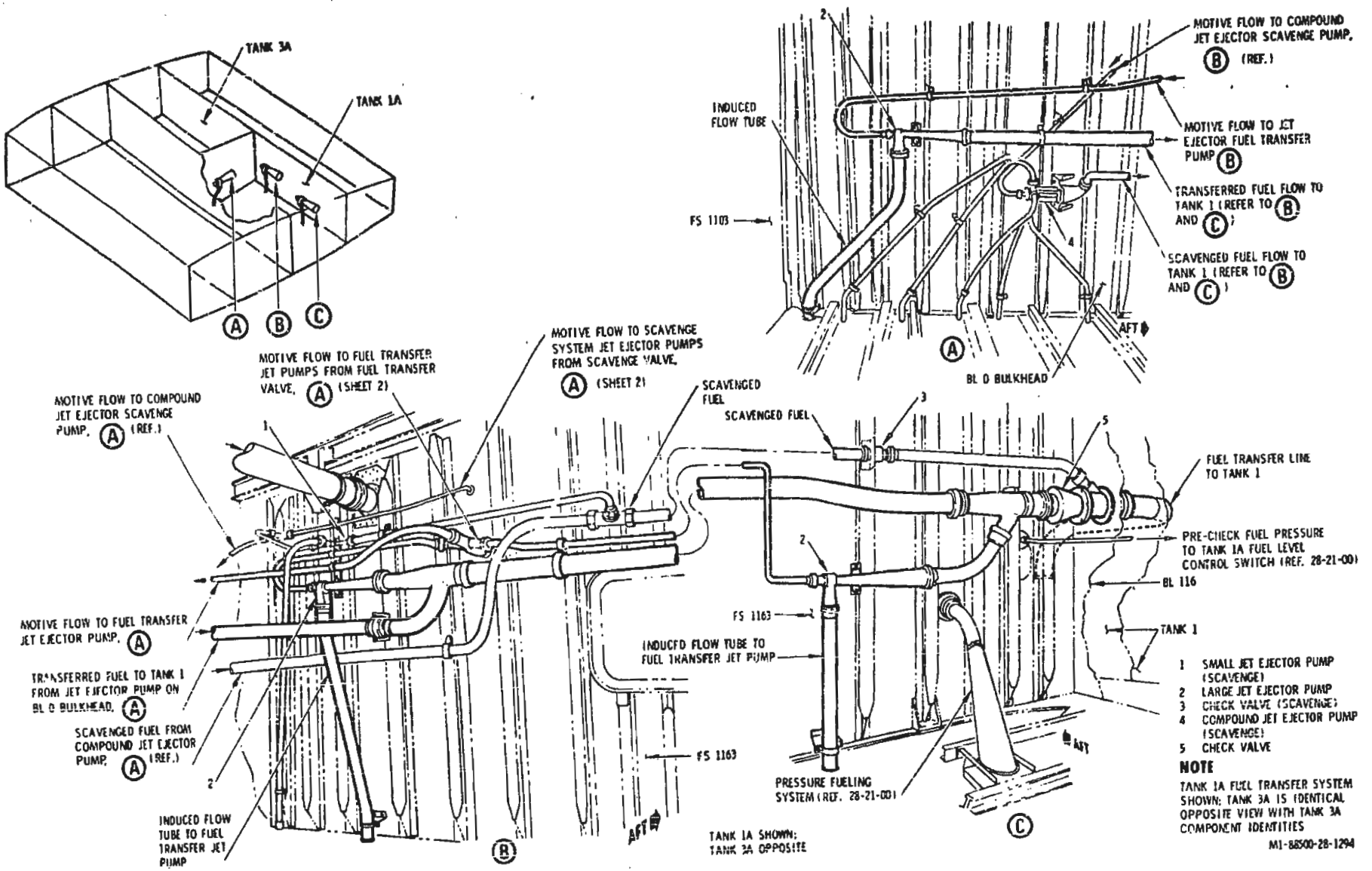
The combined induced and motive fuel from the three ejector pumps in each tank is routed through a common fuel transfer line and check valve (Ref. Fig. 1, Item 5) and dumped into the adjacent wing tank surge box area, along with the induced and motive fuel flow from the center section tank fuel and condensate jet ejector scavenge system pumps (Ref. 28-11-00). Additional components in each tank 1A/3A transfer system are fuel transfer select switches on the FE/SO FUEL SYSTEM panel, fuel transfer/scavenge valve relays, high fuel level sensing thermistors in tank 1 and 3, and fuel quantity signal conditioners that automatically control the center section fuel transfer valves (and tank 1 and 3 fuel scavenge motive flow control valves) in response to the fuel levels sensed by the thermistors.

Since sufficient motive fuel flow is not available from the tank 1 and 3 boost pumps to operate all of the ejector pumps in tank 1 and 3 and their companion tanks 1A and 3A simultaneously, motive fuel flow to the fuel/condensate scavenge system ejector pumps in tanks 1 and 3 is controlled by fuel scavenge motive flow control valves. These valves are located on the center section rear beam adjacent to the tank 1A/3A fuel transfer valves. The valves are electrically closed and the tank 1/3 ejector pumps deactivated whenever the fuel transfer mode valves are open.

NOTE: One ejector pump in tank 1 and 3 will still be active as its motive fuel is not dependent on scavenge control valve position.

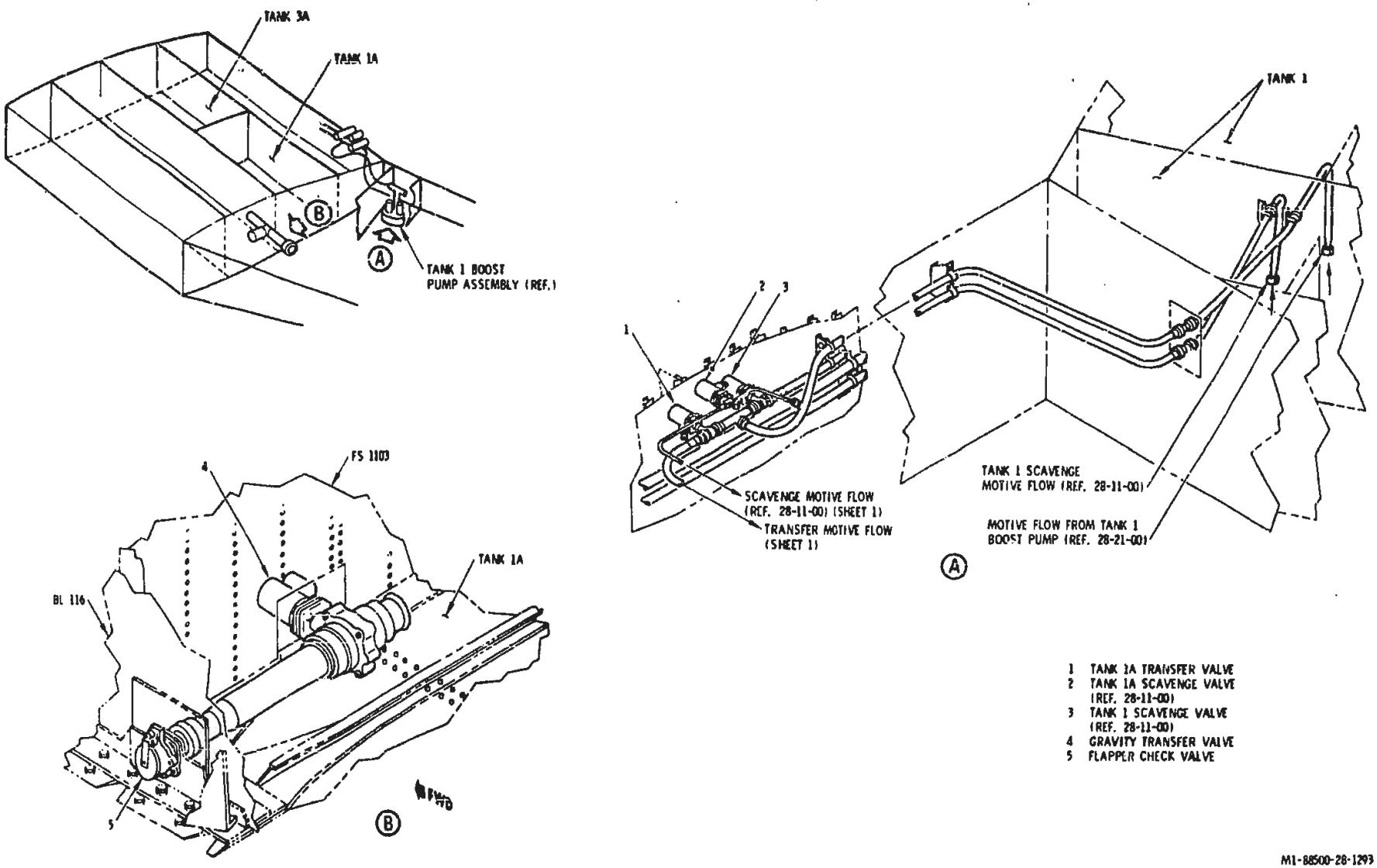
C. Tank 1A and 3A Fuel Transfer (Gravity Flow)

Gravity flow control valves (Ref. Fig. 1 and 7) installed in each wing center section tank may be electrically opened by depressing the appropriate tank 1A or tank 3A GRAVITY TRANSFER switchlight on the FE/SO FUEL SYSTEM panel. When opened, the valves establish a direct path for fuel to flow into the adjacent tank 1 or 3 wing tank and provide the FE/SO a means of transferring fuel into the wing tank in event the normal jet ejector pump transfer system malfunctions. The valves are also automatically opened when tank 1 and 3 fuel jettison is selected. Valve actuators


TANK 3A
TANK 1A
A
B
C
MOTIVE FLOW TO COMPOUND JET EJECTOR SCAVENGE PUMP, B (REF.)
INDUCED FLOW TUBE
MOTIVE FLOW TO JET EJECTOR FUEL TRANSFER PUMP B
TRANSFERRED FUEL FLOW TO TANK 1 (REFER TO B AND C)
FS 1103
SCAVENGED FUEL FLOW TO TANK 1 (REFER TO B AND C)
AFT
BL 0 BULKHEAD
MOTIVE FLOW TO FUEL TRANSFER JET PUMPS FROM FUEL TRANSFER VALVE, A (SHEET 2)
MOTIVE FLOW TO SCAVENGE SYSTEM JET EJECTOR PUMPS FROM SCAVENGE VALVE, A (SHEET 2)
SCAVENGED FUEL
SCAVENGED FUEL
MOTIVE FLOW TO COMPOUND JET EJECTOR SCAVENGE PUMP, A (REF.)
FUEL TRANSFER LINE TO TANK 1
PRE-CHECK FUEL PRESSURE TO TANK 1A FUEL LEVEL CONTROL SWITCH (REF. 28-21-00)
BL 116
TANK 1
MOTIVE FLOW TO FUEL TRANSFER JET EJECTOR PUMP, A
TRANSFERRED FUEL TO TANK 1 FROM JET EJECTOR PUMP ON BL 0 BULKHEAD, A
SCAVENGED FUEL FROM COMPOUND JET EJECTOR PUMP, A (REF.)
INDUCED FLOW TUBE TO FUEL TRANSFER JET PUMP
FS 1163
INDUCED FLOW TUBE TO FUEL TRANSFER JET PUMP
FS 1163
PRESSURE FUELING SYSTEM (REF. 28-21-00)
AFT
AFT
TANK 1A SHOWN; TANK 3A OPPOSITE
1 SMALL JET EJECTOR PUMP (SCAVENGE)
2 LARGE JET EJECTOR PUMP
3 CHECK VALVE (SCAVENGE)
4 COMPOUND JET EJECTOR PUMP (SCAVENGE)
5 CHECK VALVE
NOTE
TANK 1A FUEL TRANSFER SYSTEM SHOWN; TANK 3A IS IDENTICAL OPPOSITE VIEW WITH TANK 3A COMPONENT IDENTITIES
M1-68500-28-1294

Tank 1A/3A Fuel Transfer System
Figure 1 (Sheet 1)

R EFFECTIVITY: 025-026, 028-999
R


TANK 3A
TANK 1A
TANK 1 BOOST PUMP ASSEMBLY (REF.)
FS 1109
BL 116
TANK 1A
TANK 1
SCAVENGE MOTIVE FLOW (REF. 28-11-00) (SHEET 1)
TRANSFER MOTIVE FLOW (SHEET 1)
TANK 1 SCAVENGE MOTIVE FLOW (REF. 28-11-00)
MOTIVE FLOW FROM TANK 1 BOOST PUMP (REF. 28-21-00)
1 TANK 1A TRANSFER VALVE
2 TANK 1A SCAVENGE VALVE (REF. 28-11-00)
3 TANK 1 SCAVENGE VALVE (REF. 28-11-00)
4 GRAVITY TRANSFER VALVE
5 FLAPPER CHECK VALVE
M1-88500-28-1293

Tank 1A/3A Fuel Transfer System
Figure 1 (Sheet 2)

R R EFFECTIVITY: 025-026, 028-999

0028

operate in the same manner as the tank 1A and 3A fuel transfer valve actuators described in Paragraph 2B.

2. Component Description and Operation

A. Tank 2L and 2R Fuel Transfer Valve

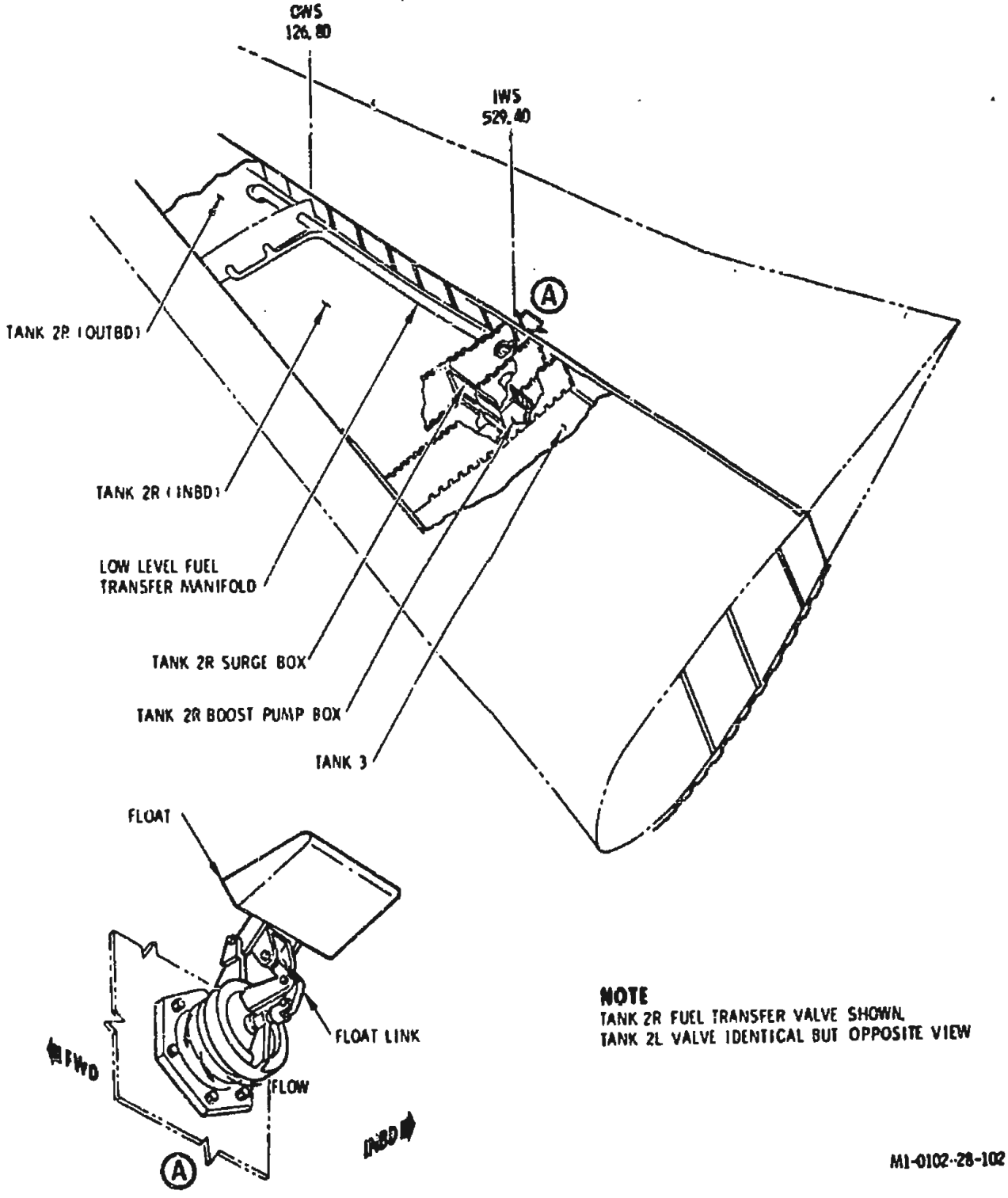
Tank 2L and 2R fuel transfer valves (Ref. Fig. 2) are float-operated valves containing spring-loaded diaphragm-controlled inlet ports. Lowering of the float with decreasing fuel level moves the diaphragm away from the inlet port and permits fuel flow through the unit. Conversely, a rising of the float reseats the diaphragm and shuts-off the fuel flow. In operation, the fuel flow through the valve occurs at a rate sufficient to keep the boost pumps located in the tank 2L/2R surges boxes submerged in fuel at all times.

B. Tank 1A/3A Fuel Transfer Valves

Each tank 1A/3A wing center section tank fuel transfer valve (Ref. Fig. 1) consists of an electrically operated actuator and a valve body which houses a butterfly type shutoff valve. The valves, one for each center section tank, are mounted on the wing center section rear beam in the center section dry bay area, zones 141.7 and 141.8. The actuator portion of the valve assembly is on the aft side of the beam and is accessible from the MLG wheel wells, zones 148 and 149.

The actuator contains an integral, series type, reversible motor, a gear train, and a roller type clutch. Cam operated switches limit output shaft rotation to 90 degrees in both clockwise and counterclockwise directions at which points the clutch disengages the actuator output shaft and allows the motor to coast to a stop. An isolation relay is used to prevent operation of the actuator if voltage is applied to the previously energized motor circuit. An output voltage existing at pin 3 of the actuator electrical connector is used to provide a flight station disagreement light indication if the actuator position is not in agreement with the selected valve control circuit. This circuit remains active whenever the valve is in-transit to provide a flight station indication of valve response to the selected position. A manual override lever, operated by the actuator output shaft, provides a mechanical indication of valve position and may be used to manually operate the valve in either direction.

C. Tank 1A/3A Fuel Transfer Jet Pumps



Tank 2L/2R Fuel Transfer Valve
Figure 2

Three large (single nozzle) fuel transfer jet ejector pumps (Fig. 1, 3, and 5) are installed in each of the wing center section tanks (1A and 3A) as described in Paragraph 1B. A cross-section view of the pump is shown in Figure 3. In operation, motive fuel supplied by the tank 1/3 fuel boost pumps flowing through the nozzle into the reduced area (venturi) portion of the pump housing, creates, by aspiration, an induced secondary flow of fuel into the suction inlet port. Induced flow is the fuel being transferred and is combined with the motive fuel and ejected from the pump outlet port into a manifold which directs it through a check valve into the tank 1 and 3 surge boxes.

D. Tank 1A/3A Fuel Transfer Line Check Valve

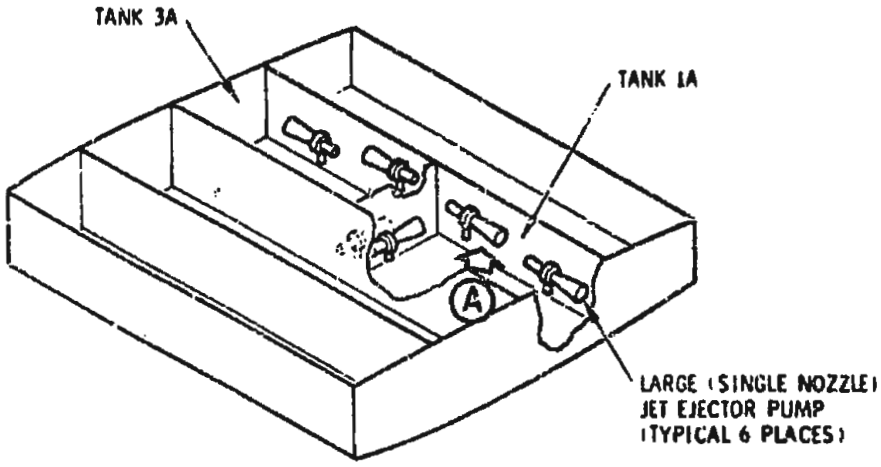
One 2-1/2-inch diameter flapper check valve (Ref. Fig. 1 and 5) is installed in the tank 1A and 3A fuel transfer lines. The combined motive and induced fuel flows from the three fuel transfer jet ejector pumps and is routed through its respective check valve before being dumped into the inboard wing tank surge boxes. The check valve inhibits reverse flow of fuel from the wing tank into the center section tank when the transfer system is inactive.

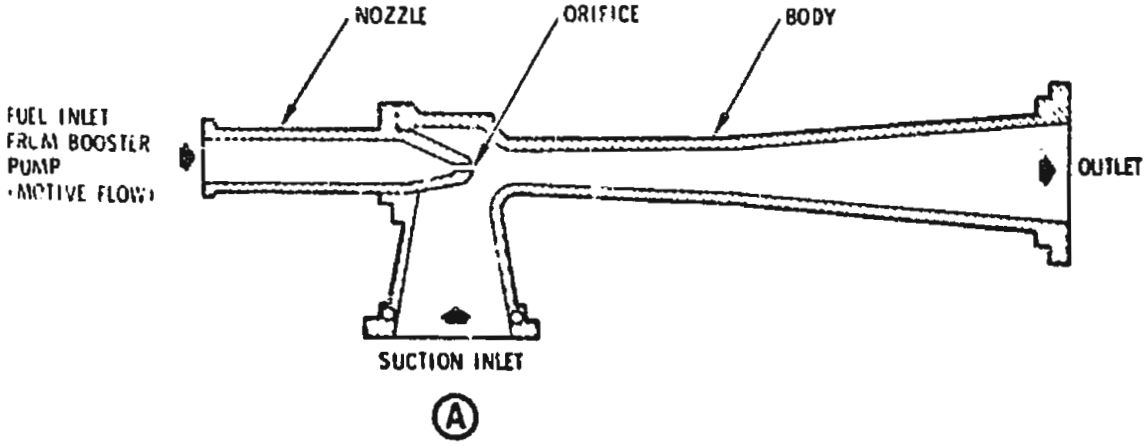
E. Tank 1 and 3 High Fuel Level Sensors (Thermistors)

To prevent overfilling of tanks 1 and 3, center section tank fuel transfer is controlled by thermistors located at the full tank levels in wing tanks 1 and 3 (Ref. Fig. 4 and 6). The thermistors control the logic which automatically switch the tank 1A/3A fuel transfer and tank 1/3 fuel scavenge valves to the fuel transfer or fuel scavenge mode positions.

NOTE: With tank 1A and 3A fuel transfer selected, all the fuel/condensate scavenge ejector pumps, except one, in tank 1 and 3 are deactivated and motive fuel flow from the boost pumps is directed through the center tank fuel transfer valve to power the fuel transfer jet ejector pumps. In the fuel transfer mode, tank 1A and 3A fuel transfer valves are open and tank 1 and 3 fuel scavenge valves are closed, shutting off motive fuel to the tank 1 and 3 fuel/condensate jet ejector scavenge pumps. With tank 1A and 3A fuel transfer selected off, the transfer valves are closed, the tank 1 and 3 scavenge valves are open, and motive fuel is directed to all of the tank 1 and 3 fuel/condensate ejector pumps.

High fuel level sensing thermistors are negative resistance devices. When not covered by fuel, thermistor resistance is low; when immersed in fuel, thermistor is high. Thermistor resistance is applied as an input signal to the tank 1/1A





M1-74900-28-1206

Tank 1A/3A Fuel Transfer Jet Ejector Pumps
Figure 3

and 3/3A signal conditioners which respond to the resistance level to either open or close an internal relay which, in turn, controls the operational mode of the fuel transfer and scavenge valves.

3. System Operation

A. Tank 1A/3A Fuel Transfer (Ref. Fig. 5, 6, and 7)

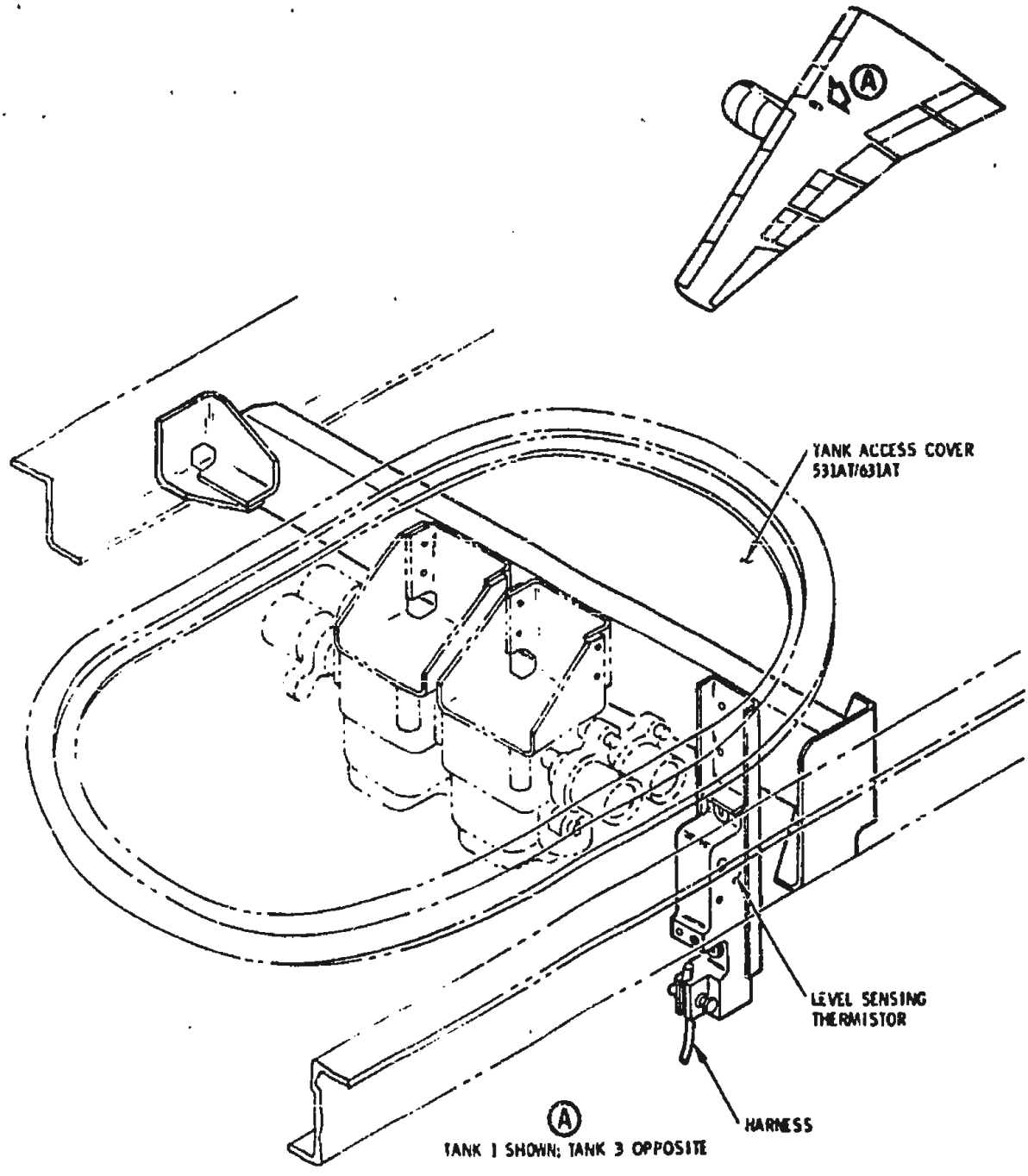
NOTE: Tank 1A and 3A fuel transfer systems are identical except for component tank identity. The following text, therefore, refers only to the tank 1A transfer system.

Fuel transfer is initiated by depressing (latching) the FE/SO FUEL SYSTEM panel 1A XFR switchlight.

NOTE: Closure of the tank 1 scavenge valve and opening of the tank 1 fuel transfer valve is indicated by the blue disagreement light in the 1A XFR switchlight blinking on, then off. If either valve does not move to the position commanded by the switchlight, the blue light will remain on. Illumination of the switchlight XFR legend indicates that the system is in the fuel transfer mode.

If tank 1 is full the tank 1 high fuel level sensor (thermistor) will override the fuel transfer (motive flow) valve open command. The fuel transfer valve will remain closed and the tank 1 scavenge valve will remain open. The switchlight XFR legend will therefore not be illuminated, even though the switchlight is in the fuel transfer command position. When sufficient fuel has been used to lower the tank 1 fuel level below the thermistor, the fuel transfer override command is removed and the fuel transfer and tank 1 scavenge valves will go to the fuel transfer mode. This will be indicated by the XFR legend light coming on and the blue in-transit blinking on, then off. If the rate at which fuel is being transferred from tank 1A to tank 1 is greater than the rate at which fuel is being used, the fuel level sensor thermistor will reinitiate the override signal and the tank 1 scavenge mode will be restored. However, to prevent a rapid cycling of the fuel transfer and scavenge motive flow control valves, a time delay (in the signal conditioner full level sensing logic) delays the cancellation of the override signal for a period of 90-seconds. (There is no delay in the initiation of the override when tank becomes full.)

If fuel transfer is initiated when the tank 1 fuel level is below the high fuel level thermistor, the tank 1/1A signal



M1-39700-28-1072

Tank 1/3 High Fuel Level Thermistor
Figure 4

conditioner will sense a low thermistor resistance and the internal K4 fuel transfer/scavenge control relay will be energized. 28V dc applied through the closed switchlight and K4 relay contacts energizes tank 1A scavenge valves control relay (2899-K11). With the 2899-K11 relay energized, 28V dc open power is applied to the tank 1A transfer valve actuator. Motive fuel flow through the opened valve activates the fuel transfer jet ejector pumps. Simultaneously, 28V dc close power is applied to the tank 1 scavenge valve. This shuts-off motive fuel flow to the tank 1 fuel/condensate scavenge ejector pumps (Ref. Para. A). Fuel is now being transferred into tank 1 along with fuel picked up by the tank 1A scavenge system ejector pumps (if airborne). The XFR legend in the 1A XFR switchlight, which is illuminated whenever 2899-K11 relay is energized, provides a flight station indication that the system is in the fuel transfer mode.

When tank 1 is full, the thermistor is immersed in fuel and the tank 1/1A signal conditioner senses a high thermistor resistance. The K4 relay opens and deenergizes the scavenge valves control relay. The tank 1A transfer valve closes shutting off motive fuel to the transfer ejectors and the tank 1 scavenge valve opens, restoring motive fuel to the tank 1 scavenge system ejectors.

When the tank 1A fuel level once again drops below the thermistor and the transfer mode is restored (after the go-second time delay described above). Fuel transfer continues until the thermistor is once again immersed in fuel and the cycle repeats. This on and off cycling of the fuel transfer mode is indicated by the 1A XFR valves in-transit and XFR lights cycling on, then off, with the XFR light on only when fuel is being transferred. The system will continue cycling in and out of the transfer mode until tank 1A is essentially empty. This is indicated by
R illumination of the tank 1A LOW light legend in the FE/SO FUEL SYSTEM panel TANK 1A QTY/LOW switchlight. Depressing (unlatching) the tank 1 fuel transfer switchlight will revert the tank 1A fuel transfer and tank 1 fuel scavenge motive flow valves to the tank 1 scavenge mode and cause the tank 1A XFR and LOW lights to go out.

NOTE: The tank 1A fuel transfer switchlight is normally left in (latched) for approximately 20 minutes after the low light appears to ensure transfer of all available fuel from the tank 1A area.

Depressing (latching) the tank 1A QTY/LOW switchlight will cause the tank 1 fuel gage to display tank 1A quantity only. With all fuel transferred, the indicator should drive down scale to the 0.0 (± 50) lb indication. Unlatching the

switchlight will then allow the indicator to drive up scale and display the total amount of remaining in tank 1 and 1A.

In event a malfunction occurs which inhibits closure of a tank 1A or 3A fuel transfer (motive flow) valve, tank 1 (or 3) will not overfill, as fuel will recirculate back to the center section tank through the interconnected wing and center section tank vent system. This recirculation will continue until the center section tank is empty or the fault is isolated and corrected.

B. Tank 1A/3A Gravity Transfer System (Ref. Fig. 1 and 7)

The tank 1A gravity transfer system performs two functions (Ref. Fig. 3 and 5). It provides a means of transferring fuel in event the normal ejector pump transfer system malfunctions and it allows fuel in tank 1A to flow directly into tank 1 during fuel jettisoning (Ref. 28-31-00).

With the TANK 1A GRAVITY TRANSFER switchlight in its normal released (out) position, 28V dc is applied through relaxed contacts of jettison arm relay No. 2 to the close coil of the tank 1A GRAVITY TRANSFER VALVE actuator. This circuit assures that, if the valve is open, it will be driven closed, to agree with the switch position.

To initiate fuel transfer, the switch is depressed (latched) in. 28V dc is then applied through the switch directly to the transfer valve actuator open coil. Opening of the valve will be indicated by the blue in-transit light coming on, then going out. Illumination of the XFR legend indicates that the switch is in the transfer select position.

With the gravity transfer valve open, fuel will flow into the companion wing tank 1 and 3 providing the wing tank fuel level is below that in the center section tank. Using this method of fuel transfer, fuel in the center section tank will be depleted to approximately the 800 lb level).

To terminate fuel transfer, the switch is released (unlatched) and 28V dc close power is once again applied to the valve actuator as described above.

During fuel jettisoning, open and close power to the valve actuator is switched by jettison arm relay No. 2 which is energized whenever the jettison MASTER switch is depressed (latched in).

Whenever the gravity transfer valve is in-transit to the open and closed positions, the blue light in the TANK 1A switchlight will momentarily come on, then go out. If the

1 LARGE, SINGLE NOZZLE, EJECTOR PUMP

2 CHECK VALVE

3 GRAVITY FLOW FUEL TRANSFER VALVE

4 COMPOUND, MULTIPLE NOZZLE, FUEL AND CONDENSATE EJECTOR PUMP

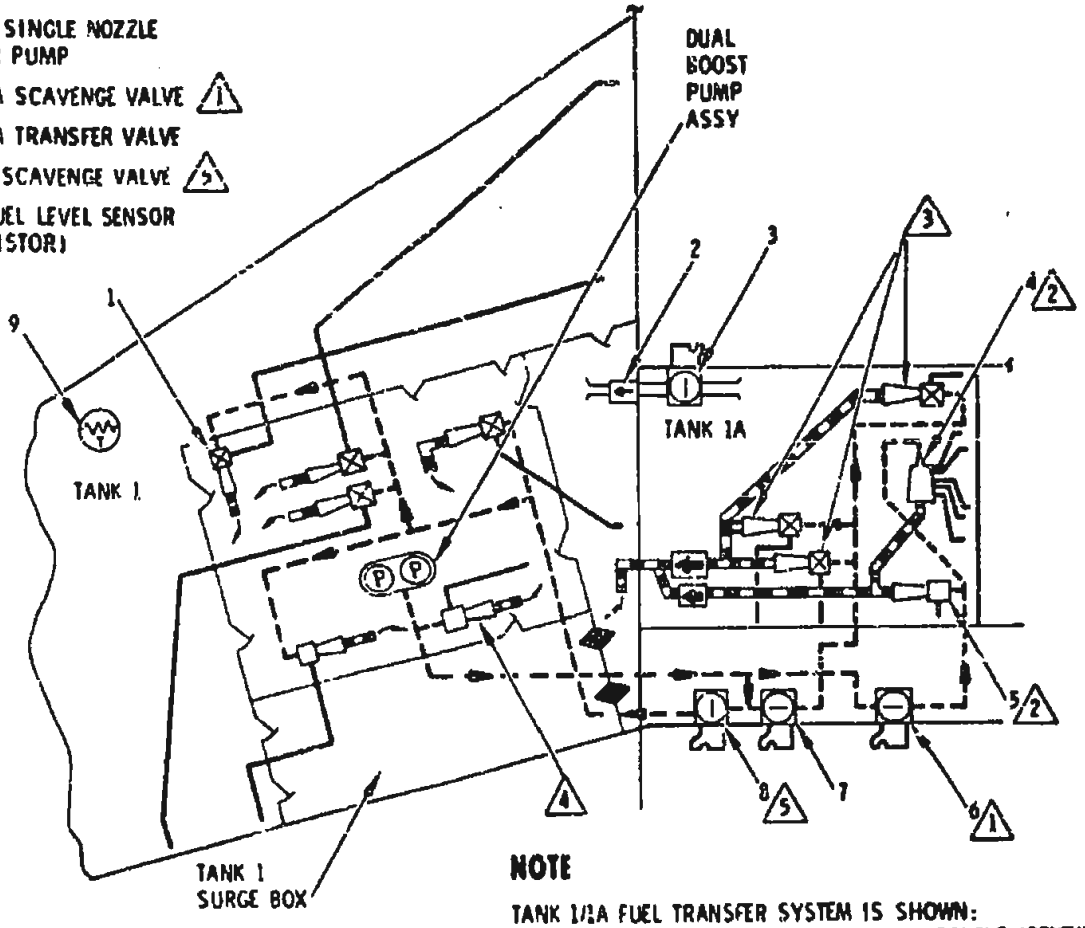
5 SMALL, SINGLE NOZZLE EJECTOR PUMP

6 TANK 1A SCAVENGE VALVE (1)

7 TANK 1A TRANSFER VALVE

8 TANK 1 SCAVENGE VALVE (5)

9 HIGH FUEL LEVEL SENSOR (THERMISTOR)



(P P) DUAL ELEMENT BOOST PUMP

MOTIVE FUEL FLOW TO JET PUMPS

INDUCED FLOW

COMBINED MOTIVE AND INDUCED FLOW

SURGE BOX FLAPPER CHECK VALVES

FREE FLOW THROUGH CUTOUTS IN STRUCTURE

NOTE

TANK 1/1A FUEL TRANSFER SYSTEM IS SHOWN: TANK 3/3A IS IDENTICAL EXCEPT FOR COMPONENT IDENTITY

(1) AUTOMATICALLY OPENED AT TAKEOFF

(2) FUEL/CONDENSATE SCAVENGE SYSTEM COMPONENTS ACTIVE ONLY WHEN SCAVENGE VALVE (ITEM 6) IS OPEN

(3) FUEL TRANSFER EJECTOR PUMPS ACTIVE ONLY WHEN TRANSFER VALVE (ITEM 7) IS OPEN

(4) FUEL/CONDENSATE SCAVENGE PUMP ACTIVE AT ALL TIMES. REMAINING 5 SCAVENGE PUMPS IN SURGE BOX ACTIVE ONLY WHEN SCAVENGE PUMP (ITEM 8) IS OPEN

(5) SCAVENGE VALVE (8) IS NORMALLY OPEN. THE VALVE CLOSES AUTOMATICALLY WHEN TRANSFER VALVE (7) IS SELECTED OPEN

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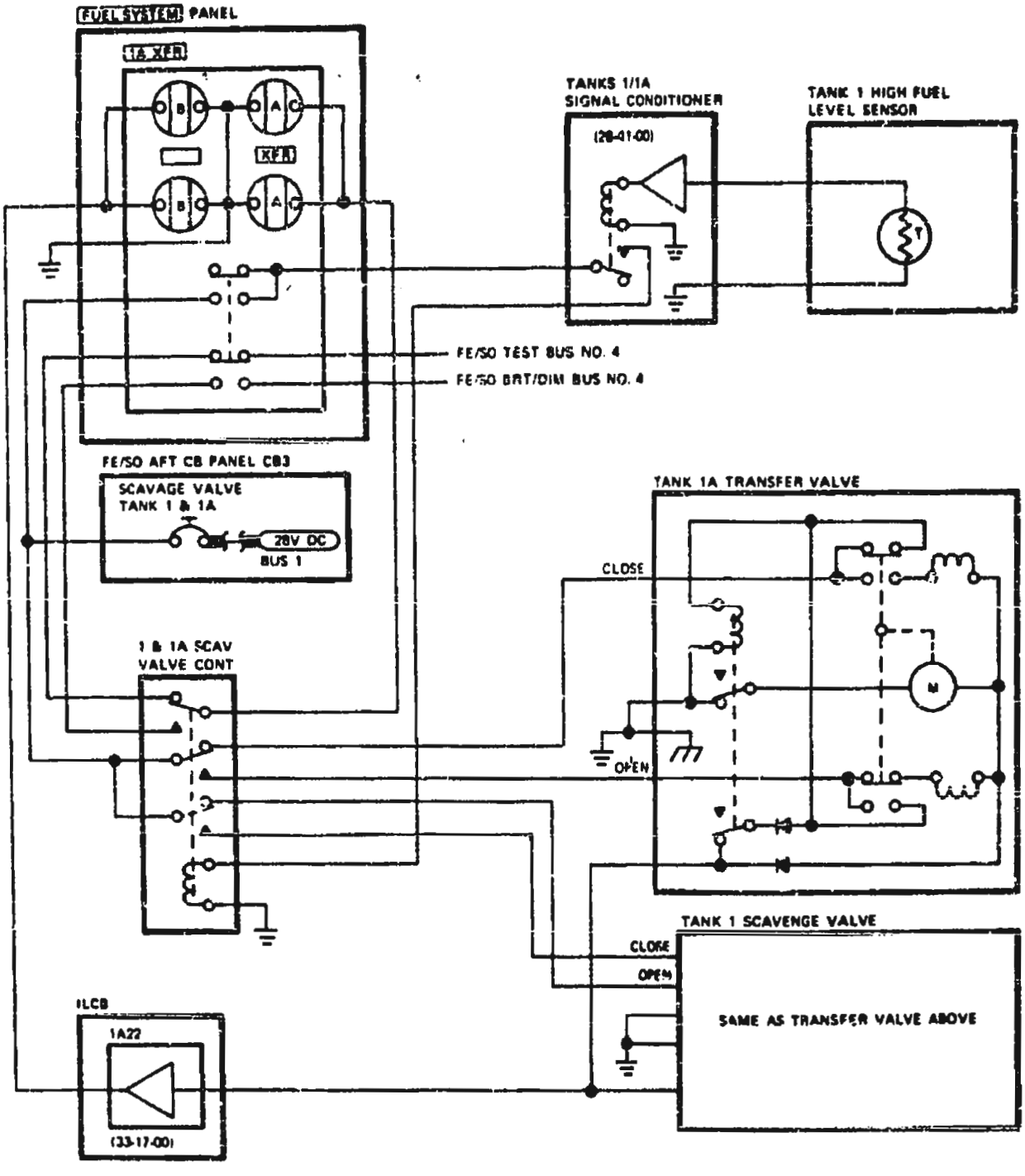
Tank 1A/3A Fuel Transfer Diagram
Figure 5

R EFFECTIVITY: 025-026, 028-999
R



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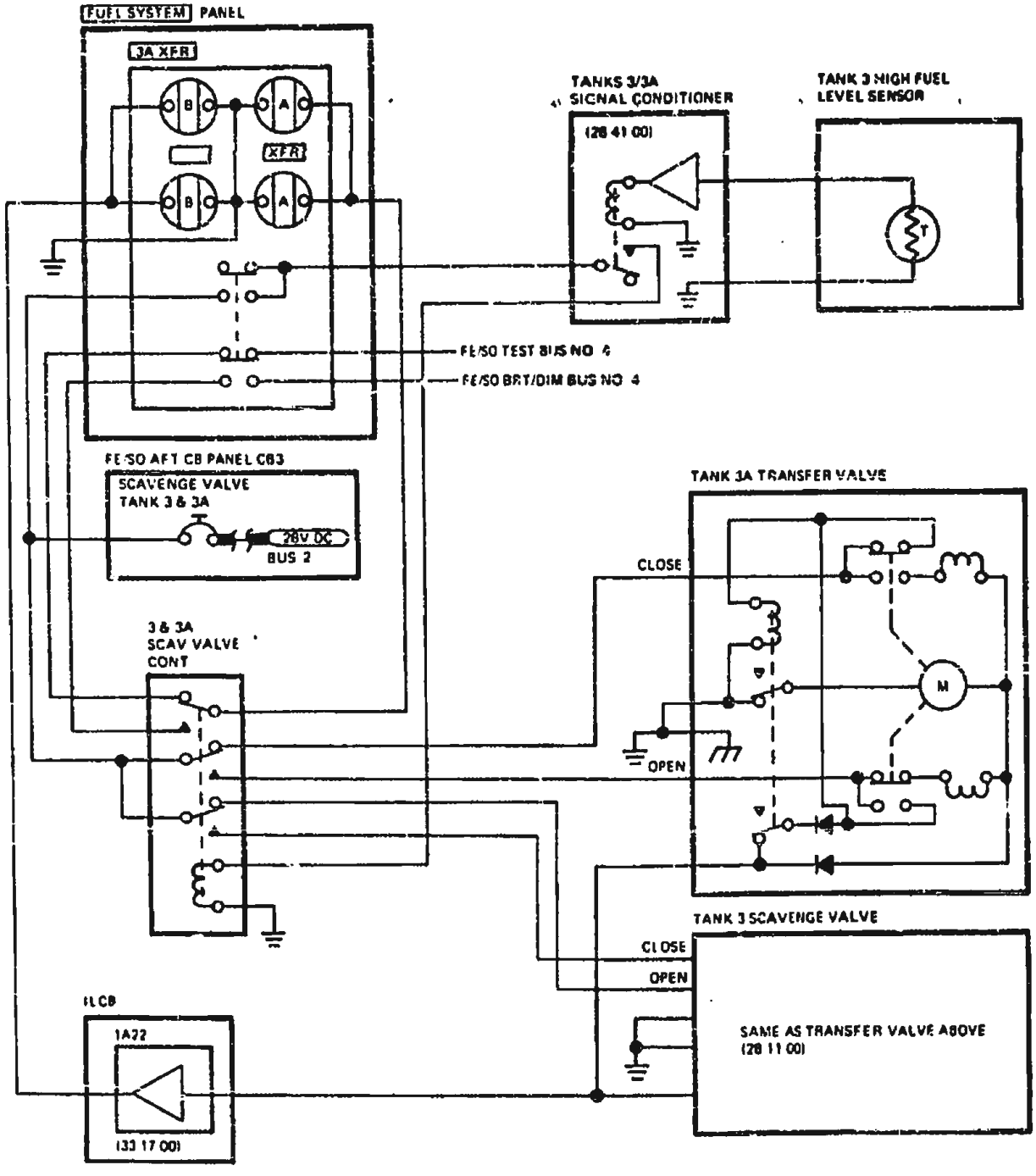
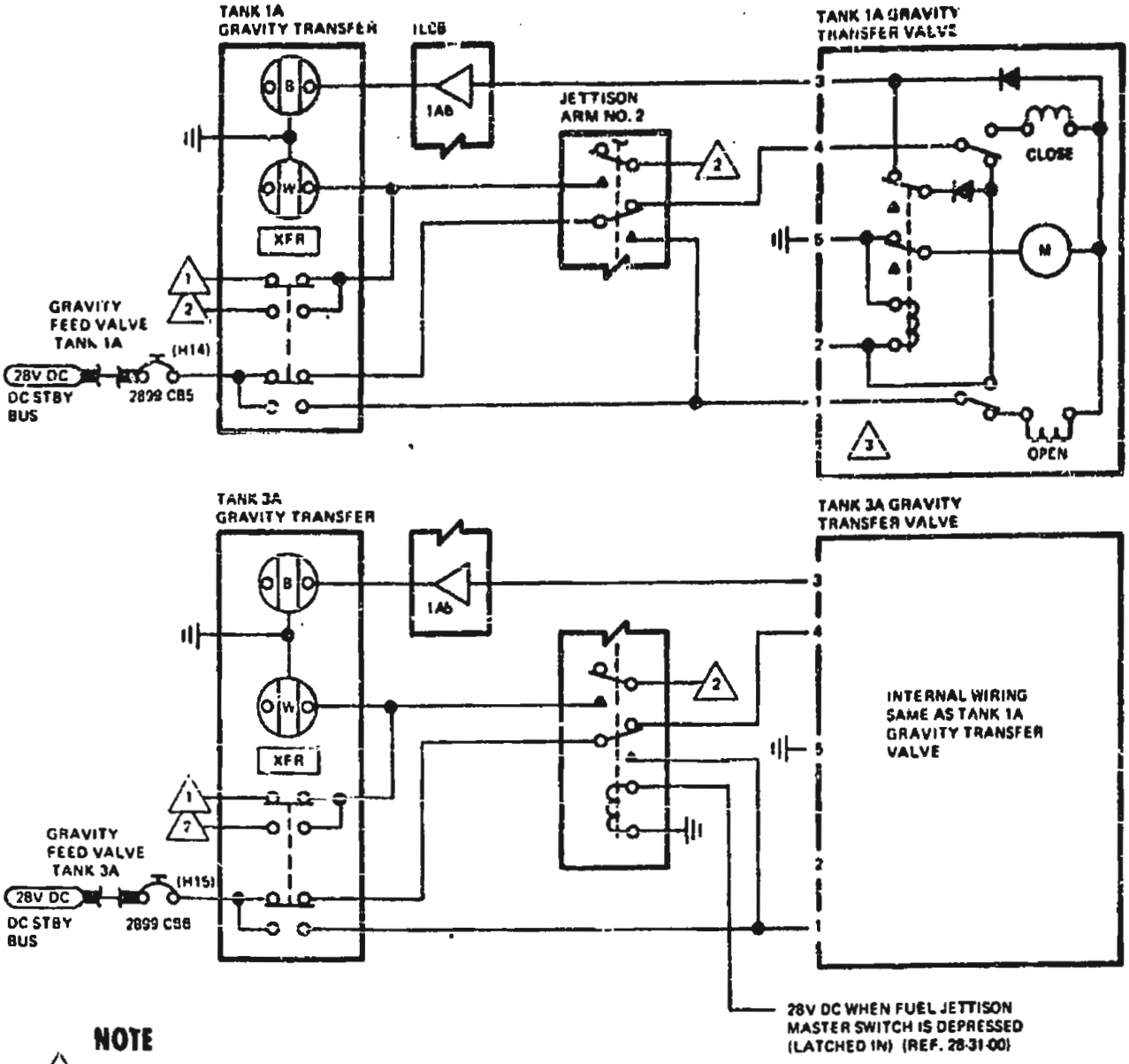
Tank 1A Fuel Transfer Simplified Schematic
Figure 6



M1-0001-78-1256

R Tank 3A Fuel Transfer Simplified Schematic
R Figure 7



NOTE

1. IND LIGHTS TEST (33-17-00)
2. IND LIGHTS BRT DIM BUS (33-17-00)
3. VALVE CLOSED, ARMED FOR OPEN CYCLE

M1-74900-28-1217

Gravity Transfer Schematic
Figure 8

blue light remains on, the valve is not in agreement with the position selected and a malfunction is indicated.

Operation of the TANK 3A gravity transfer valve occurs in the same manner as described above.

R # FUEL TRANSFER SYSTEM - FAULT ISOLATION

R 1. General

R Reference data and fault isolation procedures for troubleshooting fuel transfer system faults are included in this section of the manual. A fuel transfer system malfunction detected by the flight crew is normally entered in the aircraft flight log book and reported to maintenance personnel by a FIRM fault code number. This number and the flight log book write-up can be found in the Chapter 28 Fault Code Index. The index specifies the maintenance manual section, fault isolation diagram figure number and, where appropriate, a block nimber indicating the diagram entry point containing the fault isolation procedure. When no block number is specified, the diagram entry point is block 1.

R Prerequisites listed at the top of each diagram identify mandatory preliminary steps and circuit breakers that must be closed before initiating any fault isolation step.

R Schematic diagrams, identified by a SCHEM number, supplement fault isolation procedures as maintenance aids. The schematics show the basic system circuitry necessary for troubleshooting and include cross-reference indexes to the wiring diagram manual pages required for checking component interconnect wiring.

R 2. Fault Isolation

R Table 101 is a list of fault isolation data in this section of the manual.

R Fault Isolation Data Table 101

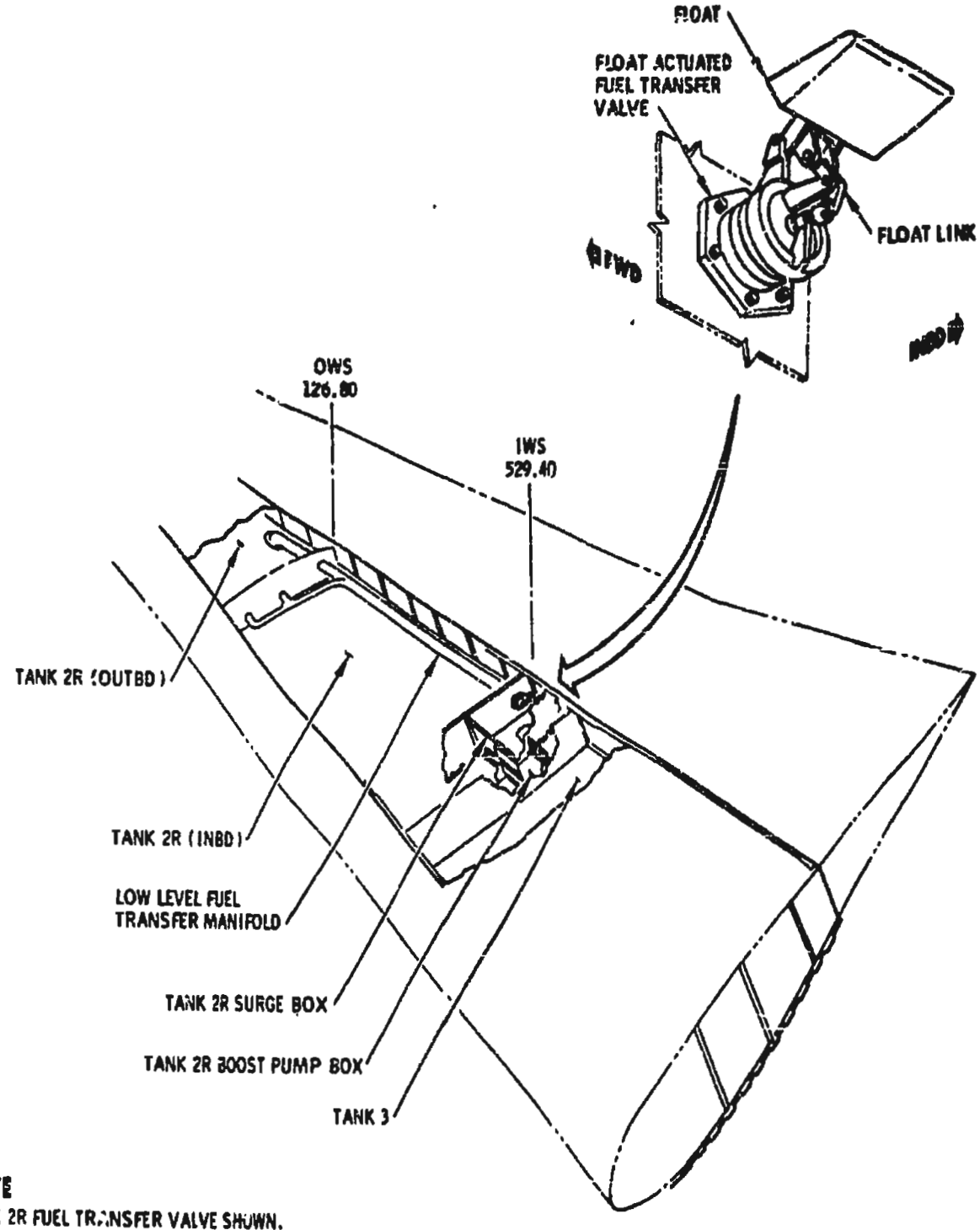
FIGURE No.	TITLE
101	Component Location Index
102	Components Locator
103	Tank 2L or 2R Fuel Transfer Fault Isolation

COMPONENT	QTY	AREA/ACCESS	REFERENCE
VALVE: FUEL TRANSFER, FLOAT ACTIVATED	2	1R2L&2R/532BB, 632BB, 532CB, 632CB	28-27-01

M1-C000-28-1403

R Component Location Index
R Figure 101

EFFECTIVITY: 001-024, 027



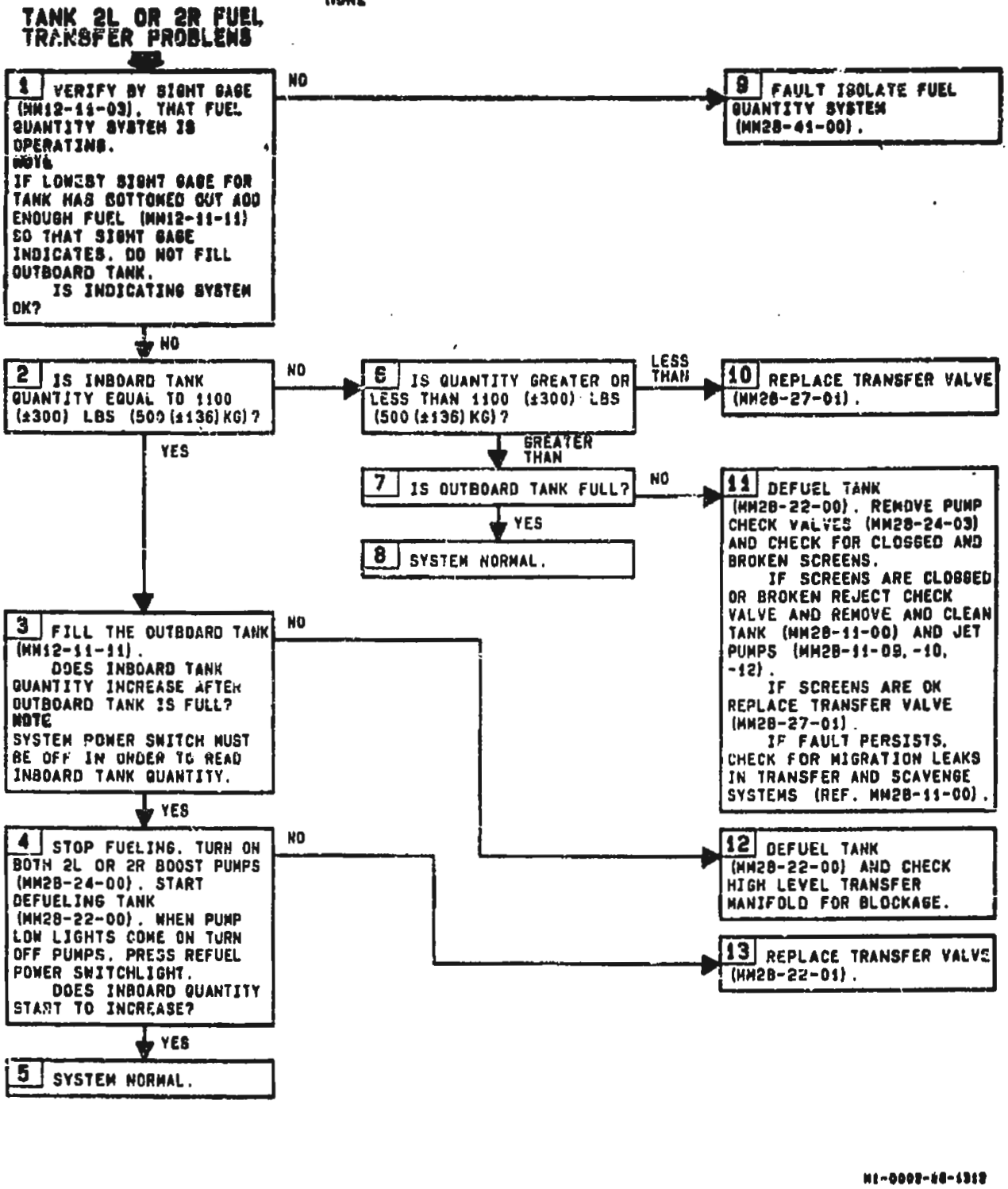
NOTE
TANK 2R FUEL TRANSFER VALVE SHOWN.
TANK 2L VALVE IDENTICAL BUT OPPOSITE VIEW

M1-83500-28-1311

R R Fuel Transfer Component Locator
Figure 102

R R EFFECTIVITY: 001-024, 027

PREREQUISITES
NONE


TANK 2L OR 2R FUEL TRANSFER PROBLEMS
1 VERIFY BY SIGHT GAGE (MM12-11-03), THAT FUEL QUANTITY SYSTEM IS OPERATING.
NOTE
IF LOWEST SIGHT GAGE FOR TANK HAS BOTTOMED OUT ADD ENOUGH FUEL (MM12-11-11) SO THAT SIGHT GAGE INDICATES. DO NOT FILL OUTBOARD TANK.
IS INDICATING SYSTEM OK?
NO
9 FAULT ISOLATE FUEL QUANTITY SYSTEM (MM28-41-00).
YES
2 IS INBOARD TANK QUANTITY EQUAL TO 1100 (±300) LBS (500 (±136) KG)?
NO
6 IS QUANTITY GREATER OR LESS THAN 1100 (±300) LBS (500 (±136) KG)?
LESS THAN
10 REPLACE TRANSFER VALVE (MM28-27-01).
GREATER THAN
7 IS OUTBOARD TANK FULL?
NO
11 DEFUEL TANK (MM28-22-00). REMOVE PUMP CHECK VALVES (MM28-24-03) AND CHECK FOR CLOGGED AND BROKEN SCREENS.
IF SCREENS ARE CLOGGED OR BROKEN REJECT CHECK VALVE AND REMOVE AND CLEAN TANK (MM28-11-00) AND JET PUMPS (MM28-11-09, -10, -12).
IF SCREENS ARE OK REPLACE TRANSFER VALVE (MM28-27-01).
IF FAULT PERSISTS, CHECK FOR MIGRATION LEAKS IN TRANSFER AND SCAVENGE SYSTEMS (REF. MM28-11-00).
YES
8 SYSTEM NORMAL.
3 FILL THE OUTBOARD TANK (MM12-11-11).
DOES INBOARD TANK QUANTITY INCREASE AFTER OUTBOARD TANK IS FULL?
NOTE
SYSTEM POWER SWITCH MUST BE OFF IN ORDER TO READ INBOARD TANK QUANTITY.
NO
12 DEFUEL TANK (MM28-22-00) AND CHECK HIGH LEVEL TRANSFER MANIFOLD FOR BLOCKAGE.
YES
4 STOP FUELING. TURN ON BOTH 2L OR 2R BOOST PUMPS (MM28-24-00). START DEFUELING TANK (MM28-22-00). WHEN PUMP LOW LIGHTS COME ON TURN OFF PUMPS. PRESS REFUEL POWER SWITCHLIGHT.
DOES INBOARD QUANTITY START TO INCREASE?
NO
13 REPLACE TRANSFER VALVE (MM28-22-01).
YES
5 SYSTEM NORMAL.

R Tank 2L or 2R Fuel Transfer Fault Isolation
R Figure 103

FUEL TRANSFER SYSTEM - FAULT ISOLATION

1. General

Reference data and fault isolation procedures for troubleshooting fuel transfer system faults are included in this section of the manual. A fuel transfer system malfunction detected by the flight crew is normally entered in the aircraft flight log book and reported to maintenance personnel by a FIRM fault code number. This number and the flight log book write-up can be found in the Chapter 28 Fault Code Index. The index specifies the maintenance manual section, fault isolation diagram figure number and, where appropriate, a block number indicating the diagram entry point containing the fault isolation procedure. When no block number is specified, the diagram entry point is block 1.

Prerequisites listed at the top of each diagram identify mandatory preliminary steps and circuit breakers that must be closed before initiating any fault isolation step.

Schematic diagrams, identified by a SCHEM number, supplement fault isolation procedures as maintenance aids. The schematics show the basic system circuitry necessary for troubleshooting and include cross-reference index to the wiring diagram manual pages required for checking component interconnect wiring.

2. Fault Isolation

Table 101 is a list of fault isolation data in this section of the manual.

Fault Isolation Data
Table 101

	FIGURE NUMBER	TITLE
	101	Component Location Index
	102	Component Locator
	103	Tank 2L or 2R Fuel Transfer Fault Isolation
R	104	Tank 1A or 3A Fuel Transfer Rate Problems
	105	1A XFR or 3A XFR Blue Disagreement Light Problems

R Fault Isolation Data (Cont)
R Table 101

FIGURE NUMBER	TITLE
106	1A or 3A XFR Light Problems
107	Tank 1A or 3A Gravity Fuel Transfer Problems
108	TANK 1A or 3A GRAVITY TRANSFER Blue Disagreement Light Problems
109	TANK 1A or 3A GRAVITY TRANSFER XFR Light Problems
110	Fuel Transfer Control Problems
SCHEM 1	Tank 1A Fuel Transfer Tank 1 Scavenge System Schematic
SCHEM 2	Tank 3A Fuel Transfer Tank 3 Scavenge System Schematic
SCHEM 2	Tank 1A and 3A Gravity Transfer System Schematic

COMPONENT	QTY	AREA/ACCESS	REFERENCE
ACTUATOR:			
TANK 1A FUEL TRANSFER VALVE	1	LEFT MLG WHEEL WELL	28-27-12
TANK 3A FUEL TRANSFER VALVE		LEFT MLG WHEEL WELL	28-27-12
TANK 1A GRAVITY TRANSFER VALVE	1	CTR SECT FWD BAY/141AZ	28-27-07
TANK 3A GRAVITY TRANSFER VALVE	1	CTR SECT FWD BAY/141AZ	28-27-07
SENSOR:			
TANK 1 FUEL LEVEL (THERMISTOR)	1	TANK 1 INTERIOR/531AT	28-27-05
TANK 3 FUEL LEVEL (THERMISTOR)	1	TANK 3 INTERIOR/631AT	28-27-05
SWITCH:			
TANK 1A FUEL TRANSFER	1	FE/SO FUEL SYS PNL	*
TANK 3A FUEL TRANSFER	1	FE/SO FUEL SYS PNL	*
TANK 1A GRAVITY TRANSFER	1	FE/SO FUEL SYS PNL	*
TANK 3A GRAVITY TRANSFER	1	FE/SO FUEL SYS PNL	*
PUMP:			
TANK 1A CMPD JET EJECTOR	1	TANK 1A/147AZ, 141.7AZ	28-27-11
TANK 3A CMPD JET EJECTOR	1	TANK 3A/147AZ, 141.8AZ	28-27-11
SINGLE NOZZLE JET EJECTOR (LARGE)	3	TANK 1A/147AZ, 141.7AZ	28-27-04
SINGLE NOZZLE JET EJECTOR (LARGE)	3	TANK 3A/147AZ, 141.8AZ	28-27-04
RELAY:			
1&1A SCAV VALVE CONT	1	MESC/192K, 137AZ, 132FR	*
3&3A SCAV VALVE CONT	1	MESC/192K, 137AZ, 132FR	*
VALVE:			
TANK 2L FUEL TRANSFER	1	2L SURGE BOX	28-27-01
TANK 2R FUEL TRANSFER	1	2R SURGE BOX	28-27-01
TANK 1A FUEL TRANSFER	1	CTR SECT AFT BAY/147AZ	28-27-02
TANK 3A FUEL TRANSFER	1	CTR SECT AFT BAY/147AZ	28-27-02
TANK 1A GRAVITY TRANSFER	1	CTR SECT FWD BAY/141AZ	28-27-06
TANK 3A GRAVITY TRANSFER	1	CTR SECT FWD BAY/141AZ	28-27-06
TANK 1A TRANSFER LINE CHECK	1	TANK 1A/147AZ, 141.7AZ	28-27
TANK 3A TRANSFER LINE CHECK	1	TANK 3A/147AZ, 141.8AZ	28-27
GRAVITY TRANSFER LINE CHECK, TK1A	1	TANK 1 INTERIOR/531CB	28-27-08
GRAVITY TRANSFER LINE CHECK, TK3A	1	TANK 3 INTERIOR/631CB	28-27-08

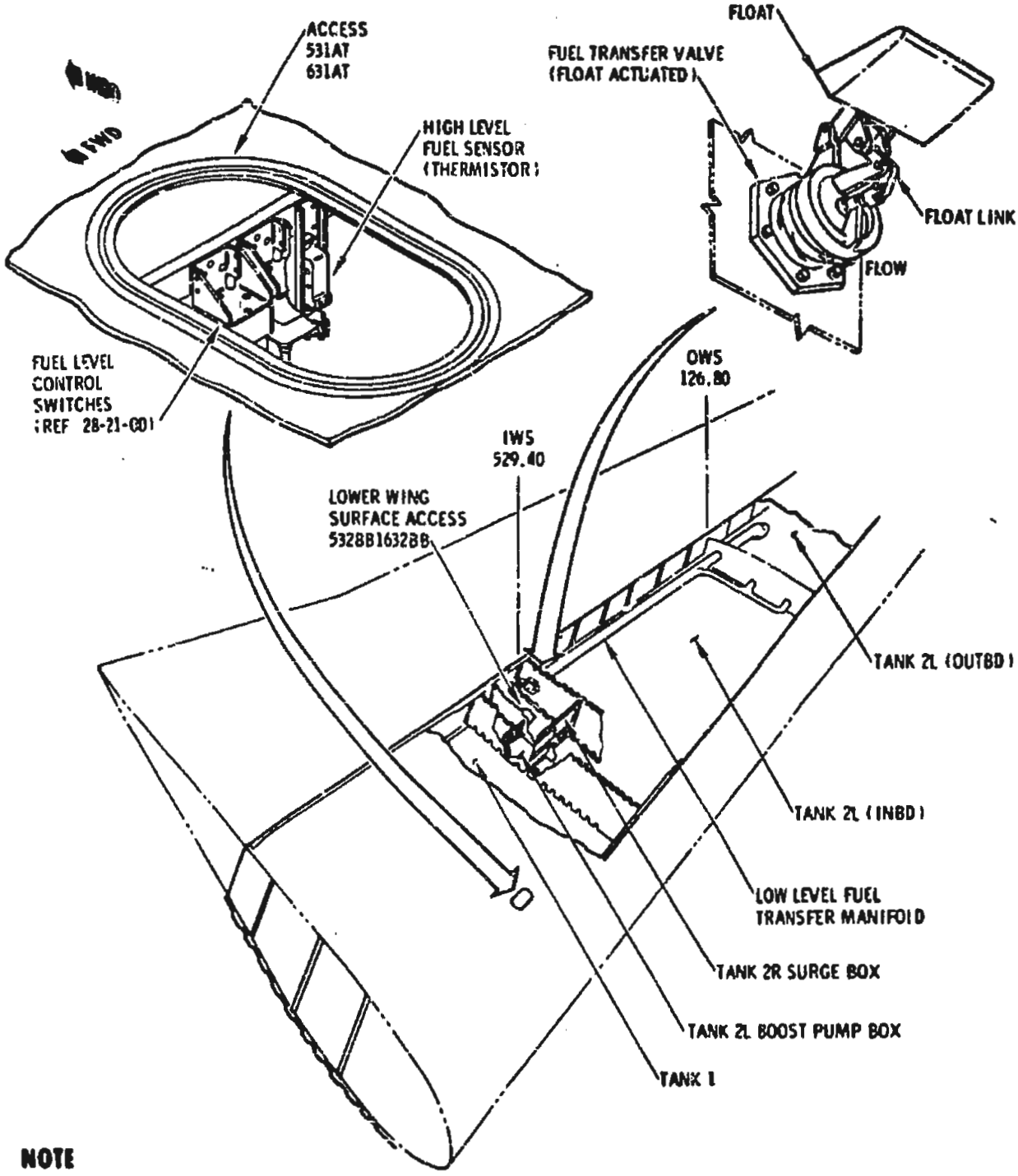
*SEE WM EQUIPMENT LIST

M1-0000-28-1495

Component Location Index
Figure 101

R EFFECTIVITY: 025-026, 028-999
R

0028

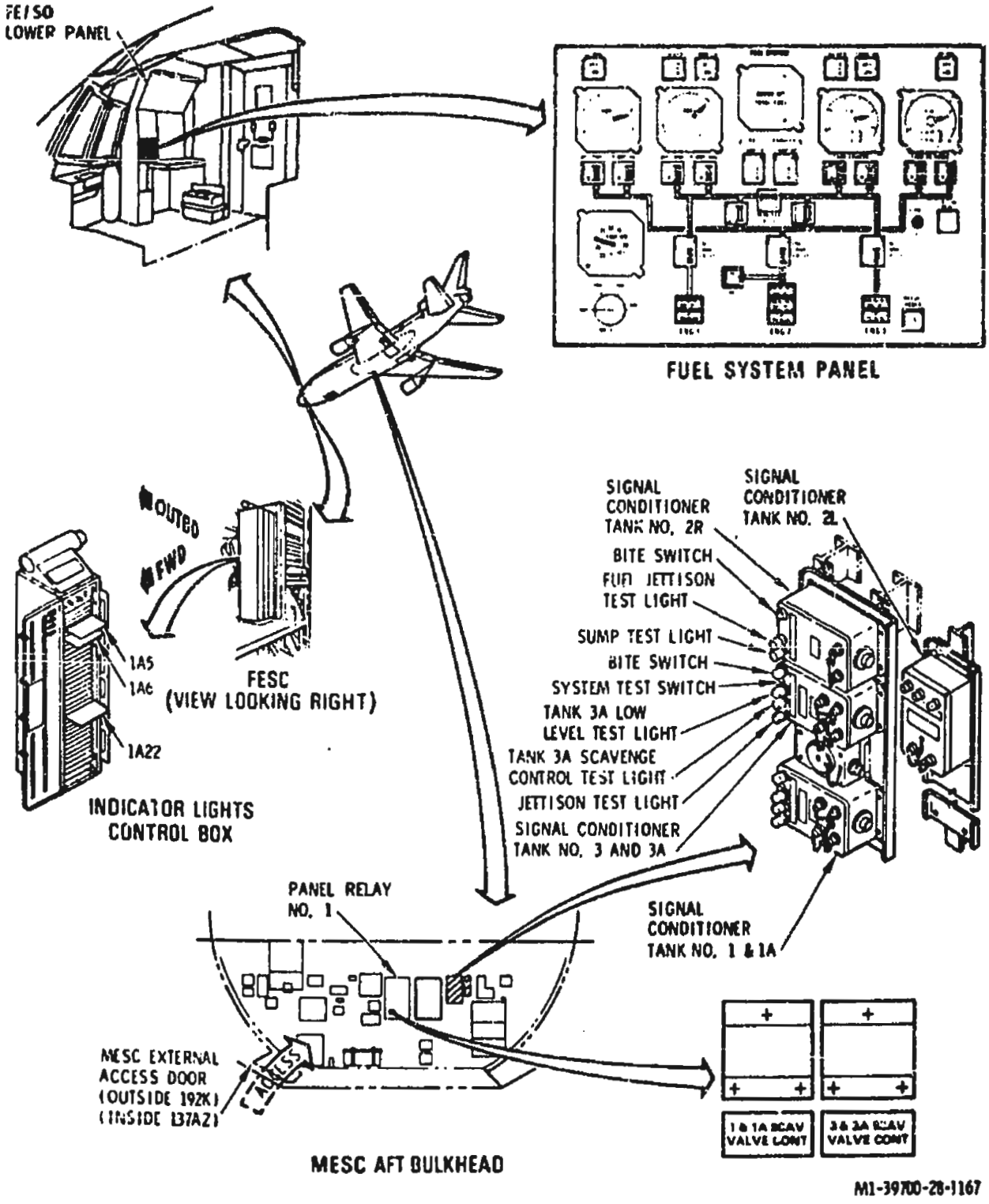


NOTE

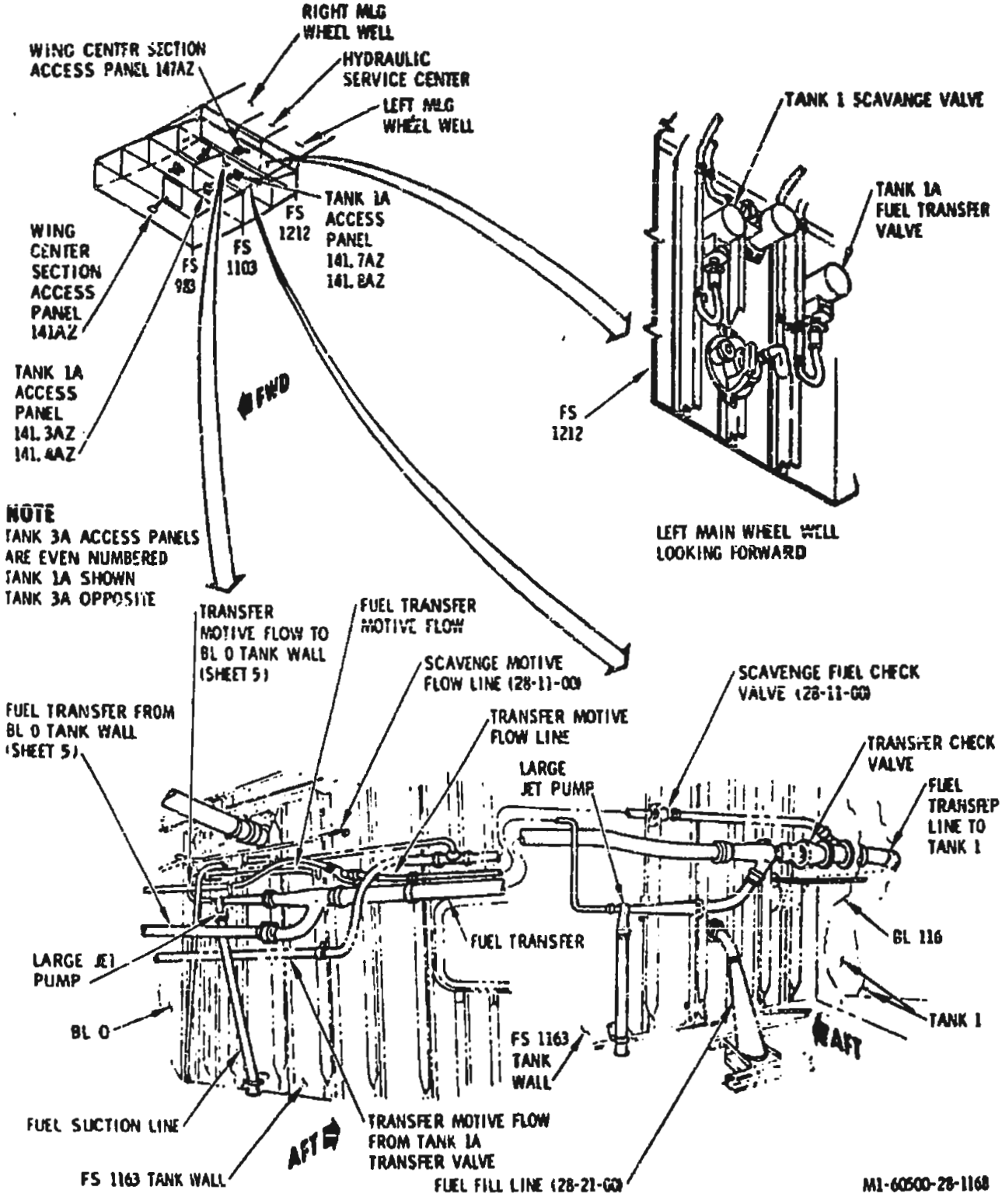
LEFT WING SHOWN RIGHT WING TANK 2L AND 3 DETAILS IDENTICAL BUT OPPOSITE VIEW

M1-88105-28-1309

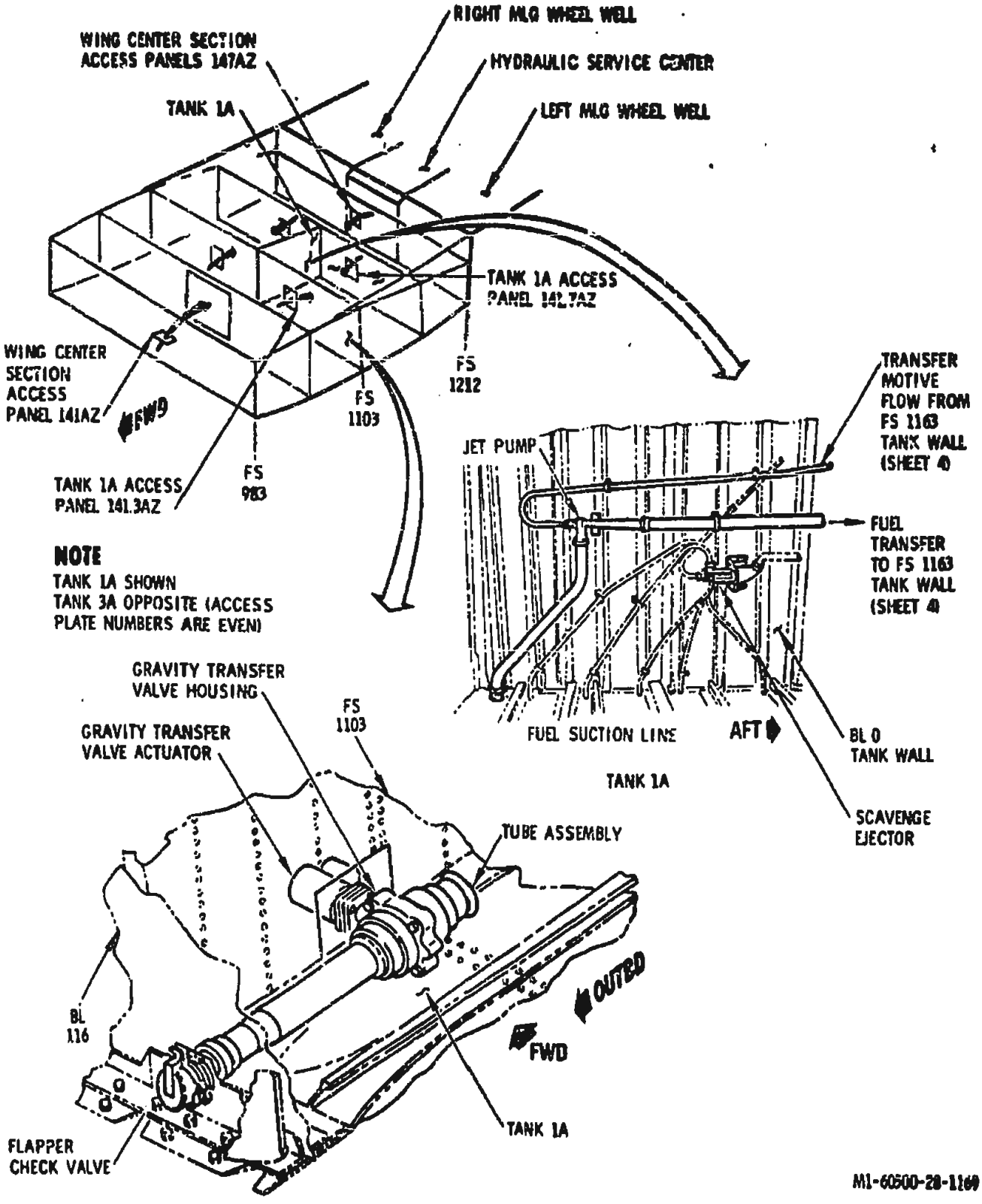
Component Locator
Figure 102 (Sheet 1)



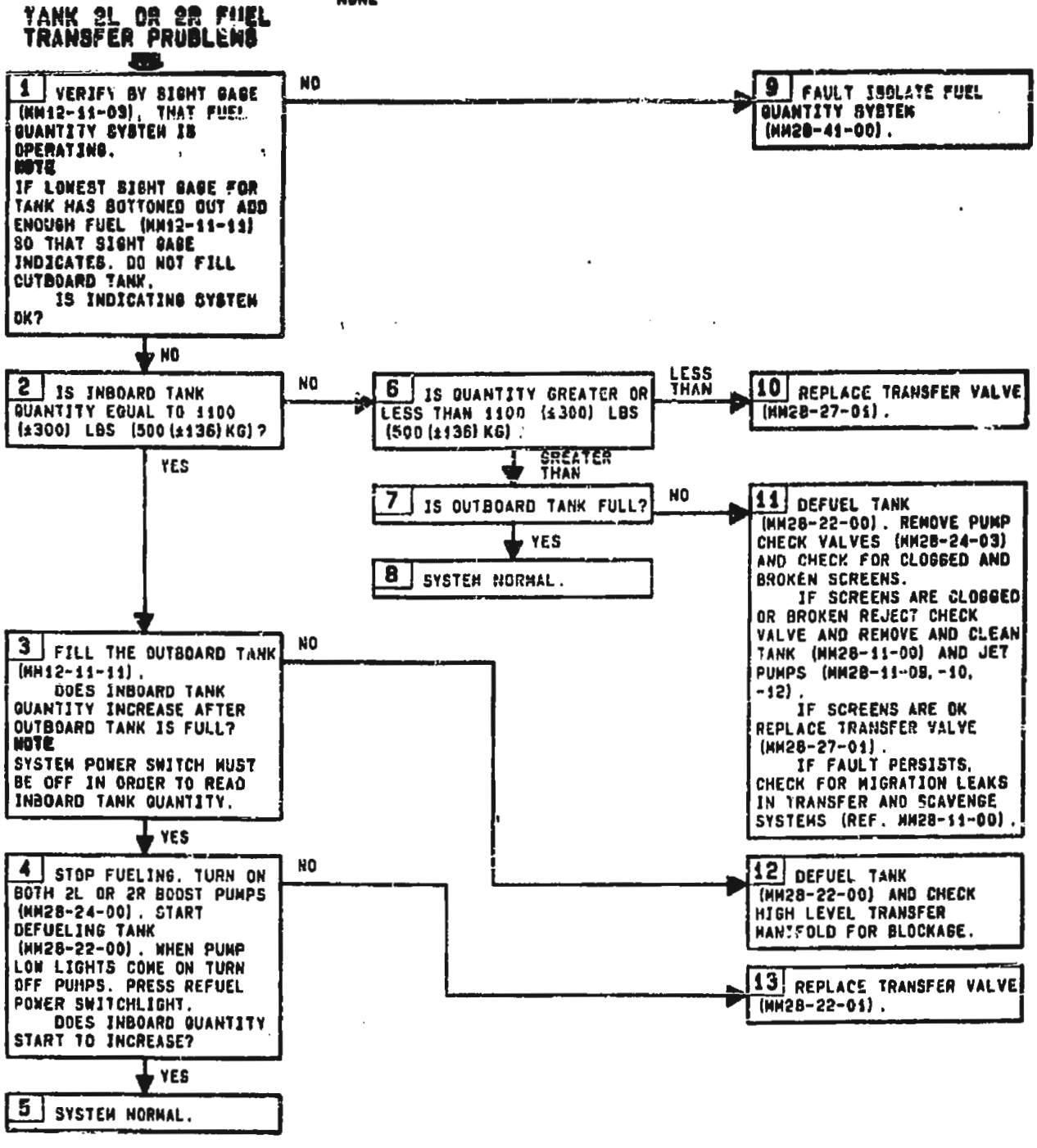
Component Locator
Figure 102 (Sheet 2)



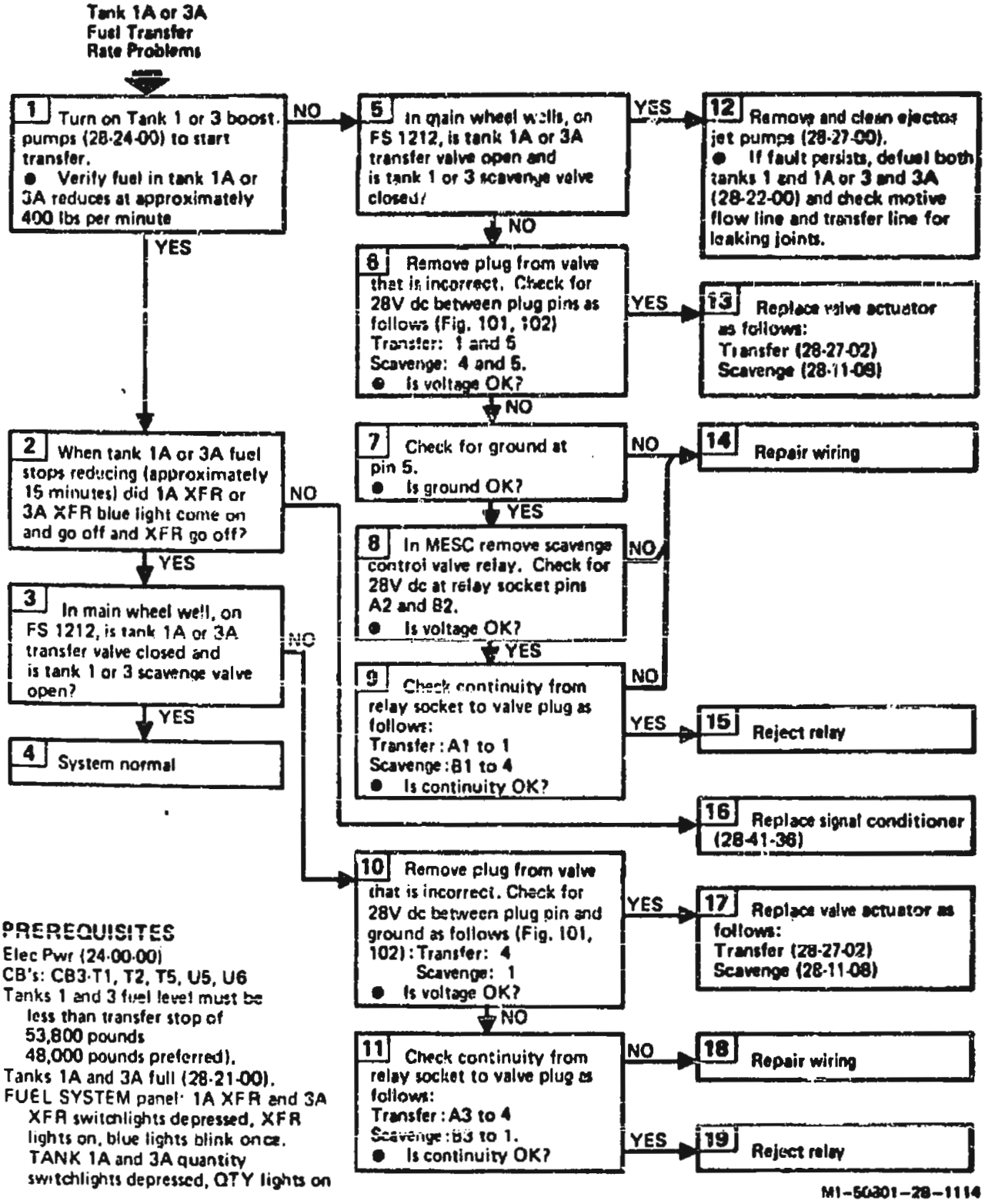
Component Locator
Figure 102 (Sheet 3)



Component Locator
Figure 102 (Sheet 4)


PREREQUISITES
NONE
TANK 2L OR 2R FUEL TRANSFER PROBLEMS
1 VERIFY BY SIGHT GAGE (MM12-11-09), THAT FUEL QUANTITY SYSTEM IS OPERATING.
NOTE
IF LOWEST SIGHT GAGE FOR TANK HAS BOTTOMED OUT ADD ENOUGH FUEL (MM12-11-11) SO THAT SIGHT GAGE INDICATES. DO NOT FILL OUTBOARD TANK.
IS INDICATING SYSTEM OK?
NO
9 FAULT ISOLATE FUEL QUANTITY SYSTEM (MM28-41-00).
NO
2 IS INBOARD TANK QUANTITY EQUAL TO 1100 (±300) LBS (500 (±136) KG)?
YES
NO
6 IS QUANTITY GREATER OR LESS THAN 1100 (±300) LBS (500 (±136) KG).
LESS THAN
10 REPLACE TRANSFER VALVE (MM28-27-01).
GREATER THAN
7 IS OUTBOARD TANK FULL?
NO
11 DEFUEL TANK (MM28-22-00). REMOVE PUMP CHECK VALVES (MM28-24-03) AND CHECK FOR CLOGGED AND BROKEN SCREENS.
IF SCREENS ARE CLOGGED OR BROKEN REJECT CHECK VALVE AND REMOVE AND CLEAN TANK (MM28-11-00) AND JET PUMPS (MM28-11-09, -10, -12).
IF SCREENS ARE OK REPLACE TRANSFER VALVE (MM28-27-01).
IF FAULT PERSISTS, CHECK FOR MIGRATION LEAKS IN TRANSFER AND SCAVENGE SYSTEMS (REF. MM28-11-00).
YES
8 SYSTEM NORMAL.
3 FILL THE OUTBOARD TANK (MM12-11-11).
DOES INBOARD TANK QUANTITY INCREASE AFTER OUTBOARD TANK IS FULL?
NOTE
SYSTEM POWER SWITCH MUST BE OFF IN ORDER TO READ INBOARD TANK QUANTITY.
NO
YES
4 STOP FUELING. TURN ON BOTH 2L OR 2R BOOST PUMPS (MM28-24-00). START DEFUELING TANK (MM28-22-00). WHEN PUMP LOW LIGHTS COME ON TURN OFF PUMPS. PRESS REFUEL POWER SWITCHLIGHT.
DOES INBOARD QUANTITY START TO INCREASE?
NO
12 DEFUEL TANK (MM28-22-00) AND CHECK HIGH LEVEL TRANSFER MANIFOLD FOR BLOCKAGE.
13 REPLACE TRANSFER VALVE (MM28-22-01).
YES
5 SYSTEM NORMAL.

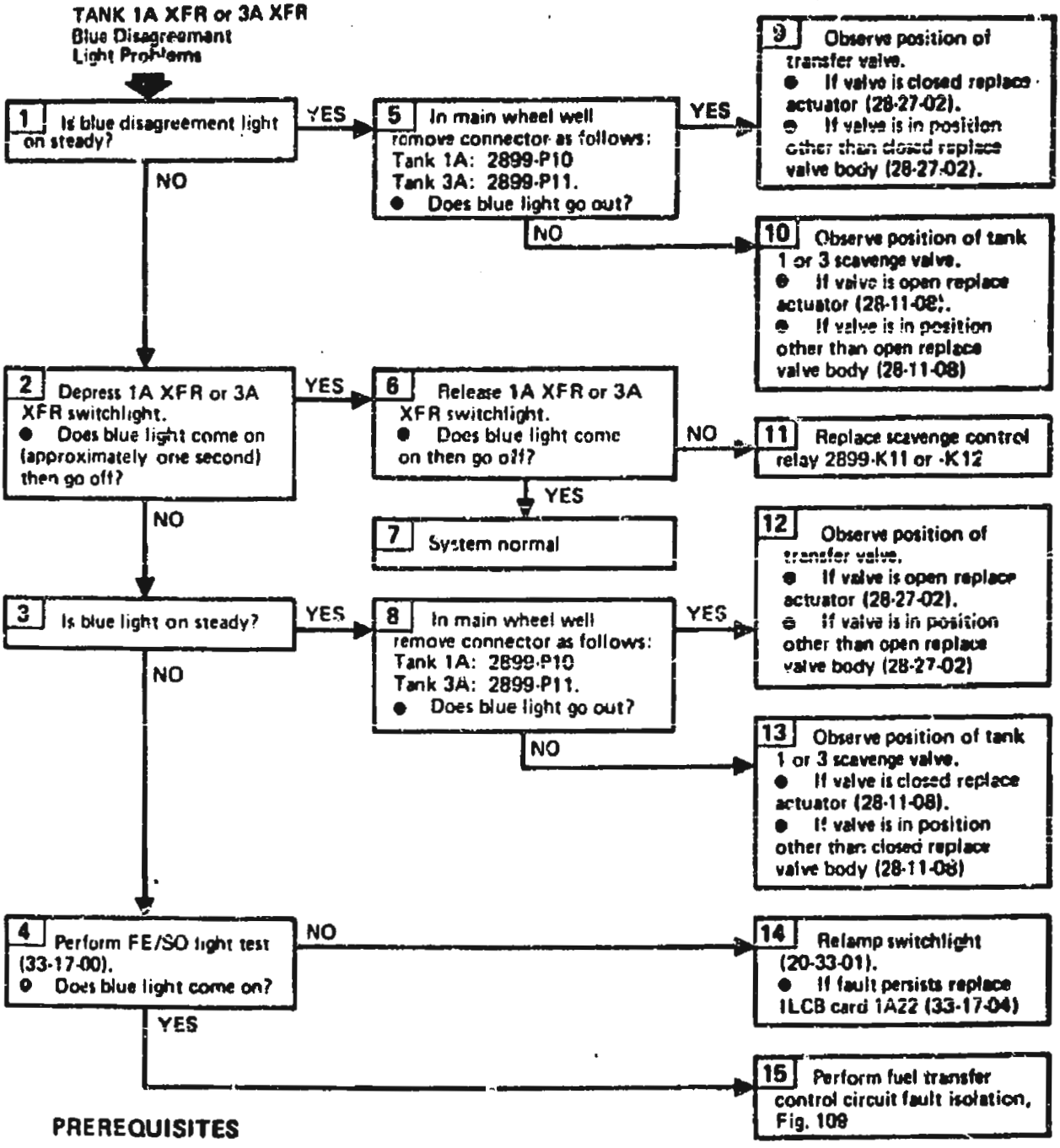
R Tank 2L or 2R Fuel Transfer Fault Isolation
R Figure 103


Tank 1A or 3A Fuel Transfer Rate Problems
1 Turn on Tank 1 or 3 boost pumps (28-24-00) to start transfer.
● Verify fuel in tank 1A or 3A reduces at approximately 400 lbs per minute
NO
YES
2 When tank 1A or 3A fuel stops reducing (approximately 15 minutes) did 1A XFR or 3A XFR blue light come on and go off and XFR go off?
NO
YES
3 In main wheel well, on FS 1212, is tank 1A or 3A transfer valve closed and is tank 1 or 3 scavenge valve open?
NO
YES
4 System normal
5 In main wheel wells, on FS 1212, is tank 1A or 3A transfer valve open and is tank 1 or 3 scavenge valve closed?
YES
12 Remove and clean ejector jet pumps (28-27-00).
● If fault persists, defuel both tanks 1 and 1A or 3 and 3A (28-22-00) and check motive flow line and transfer line for leaking joints.
NO
6 Remove plug from valve that is incorrect. Check for 28V dc between plug pins as follows (Fig. 101, 102)
Transfer: 1 and 5
Scavenge: 4 and 5.
● Is voltage OK?
YES
13 Replace valve actuator as follows:
Transfer (28-27-02)
Scavenge (28-11-08)
NO
7 Check for ground at pin 5.
● Is ground OK?
NO
14 Repair wiring
YES
8 In MESC remove scavenge control valve relay. Check for 28V dc at relay socket pins A2 and B2.
● Is voltage OK?
NO
YES
9 Check continuity from relay socket to valve plug as follows:
Transfer: A1 to 1
Scavenge: B1 to 4
● Is continuity OK?
NO
YES
15 Reject relay
16 Replace signal conditioner (28-41-36)
10 Remove plug from valve that is incorrect. Check for 28V dc between plug pin and ground as follows (Fig. 101, 102): Transfer: 4
Scavenge: 1
● Is voltage OK?
YES
17 Replace valve actuator as follows:
Transfer (28-27-02)
Scavenge (28-11-08)
NO
11 Check continuity from relay socket to valve plug as follows:
Transfer: A3 to 4
Scavenge: B3 to 1.
● Is continuity OK?
NO
18 Repair wiring
YES
19 Reject relay
PREREQUISITES
Elec Pwr (24-00-00)
CB's: CB3-T1, T2, T5, U5, U6
Tanks 1 and 3 fuel level must be less than transfer stop of 53,800 pounds
48,000 pounds preferred).
Tanks 1A and 3A full (28-21-00).
FUEL SYSTEM panel: 1A XFR and 3A XFR switchlights depressed, XFR lights on, blue lights blink once.
TANK 1A and 3A quantity switchlights depressed, QTY lights on
M1-50301-28-1114

Tank 1A or 3A Fuel Transfer Rate Problems
Figure 104

R

EFFECTIVITY: 025-026, 028-999

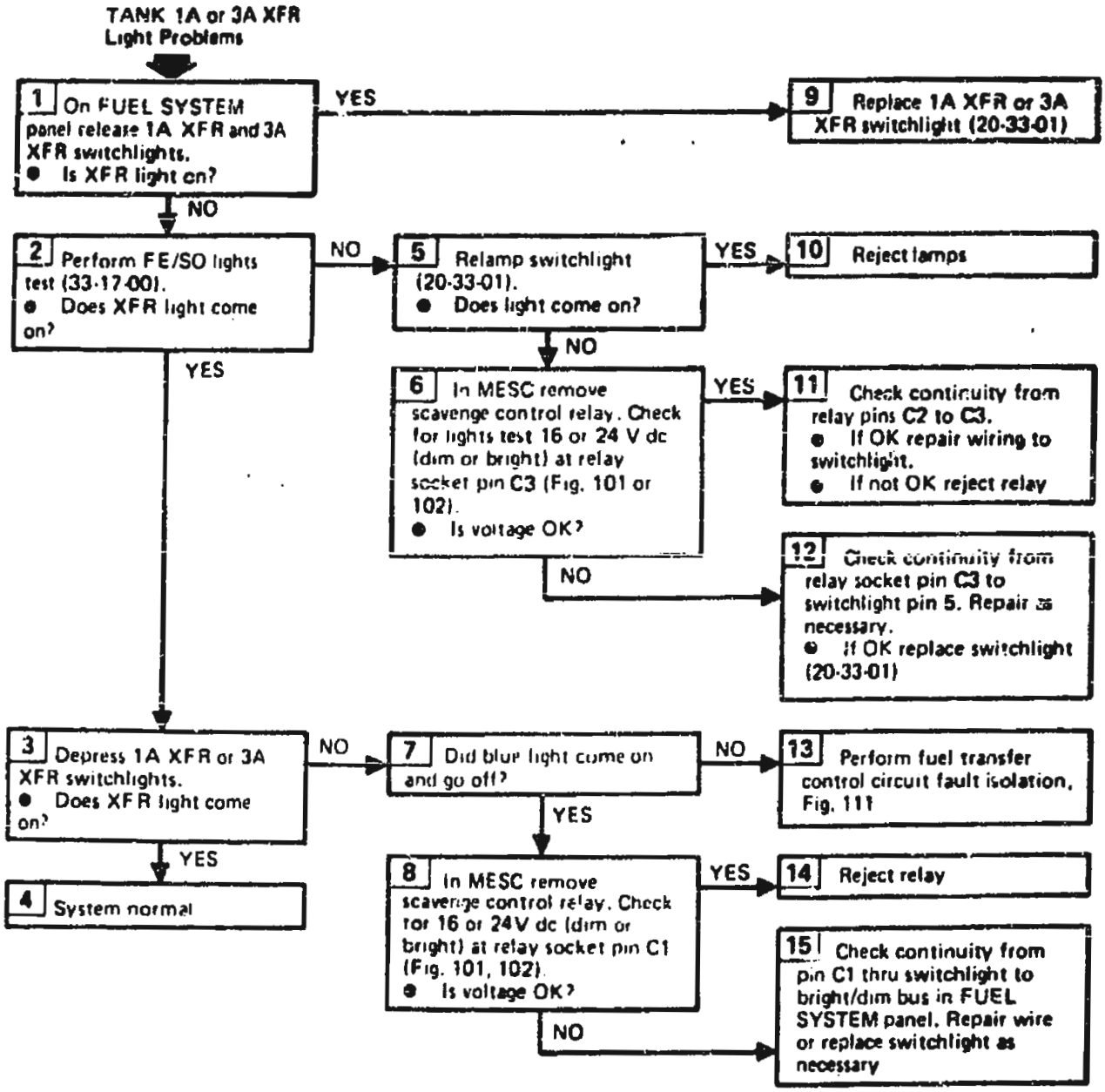

TANK 1A XFR or 3A XFR
Blue Disagreemant
Light Problems
1 Is blue disagreement light on steady?
YES
5 In main wheel well remove connector as follows:
Tank 1A: 2899-P10
Tank 3A: 2899-P11.
● Does blue light go out?
YES
9 Observe position of transfer valve.
● If valve is closed replace actuator (28-27-02).
● If valve is in position other than closed replace valve body (28-27-02).
NO
10 Observe position of tank 1 or 3 scavenge valve.
● If valve is open replace actuator (28-11-08).
● If valve is in position other than open replace valve body (28-11-08)
NO
2 Depress 1A XFR or 3A XFR switchlight.
● Does blue light come on (approximately one second) then go off?
YES
6 Release 1A XFR or 3A XFR switchlight.
● Does blue light come on then go off?
NO
11 Replace scavenge control relay 2899-K11 or -K12
YES
7 System normal
NO
3 Is blue light on steady?
YES
8 In main wheel well remove connector as follows:
Tank 1A: 2899-P10
Tank 3A: 2899-P11.
● Does blue light go out?
YES
12 Observe position of transfer valve.
● If valve is open replace actuator (28-27-02).
● If valve is in position other than open replace valve body (28-27-02)
NO
13 Observe position of tank 1 or 3 scavenge valve.
● If valve is closed replace actuator (28-11-08).
● If valve is in position other than closed replace valve body (28-11-08)
NO
4 Perform FE/SO light test (33-17-00).
● Does blue light come on?
NO
14 Relamp switchlight (20-33-01).
● If fault persists replace ILCB card 1A22 (33-17-04)
YES
15 Perform fuel transfer control circuit fault isolation, Fig. 109

PREREQUISITES

Elec Pwr (24-00-00)
CB's: CB3-T1, T2, T5, U5, U6
Tank 1 or 3 fuel level must be less than transfer stop level of 53,800 pounds (24,400 kilograms). If not defuel (28-22-00) until they are.
FUEL SYSTEM panel: 1A XFR or 3A XFR switchlight released, XFR light out

M1-0003-28-1116

R Tank 1A XFR or 3A XFR Blue Disagreement Light Problems
R Figure 105


TANK 1A or 3A XFR Light Problems
1 On FUEL SYSTEM panel release 1A XFR and 3A XFR switchlights.
● Is XFR light on?
YES
9 Replace 1A XFR or 3A XFR switchlight (20-33-01)
NO
2 Perform FE/SO lights test (33-17-00).
● Does XFR light come on?
NO
5 Relamp switchlight (20-33-01).
● Does light come on?
YES
10 Reject lamps
NO
YES
6 In MESC remove scavenge control relay. Check for lights test 16 or 24 V dc (dim or bright) at relay socket pin C3 (Fig. 101 or 102).
● Is voltage OK?
YES
11 Check continuity from relay pins C2 to C3.
● If OK repair wiring to switchlight.
● If not OK reject relay
NO
12 Check continuity from relay socket pin C3 to switchlight pin 5. Repair as necessary.
● If OK replace switchlight (20-33-01)
3 Depress 1A XFR or 3A XFR switchlights.
● Does XFR light come on?
NO
7 Did blue light come on and go off?
NO
13 Perform fuel transfer control circuit fault isolation, Fig. 111
YES
YES
4 System normal
8 In MESC remove scavenge control relay. Check for 16 or 24V dc (dim or bright) at relay socket pin C1 (Fig. 101, 102).
● Is voltage OK?
YES
14 Reject relay
NO
15 Check continuity from pin C1 thru switchlight to bright/dim bus in FUEL SYSTEM panel. Repair wire or replace switchlight as necessary

PREREQUISITES

Elec Pwr (24-00-00)
CB's: CB1-L9
CB2-J4
CB3-T1, T2, T5, U5, U6
Tanks 1 and 3 fuel level must be less than transfer stop level of 53,800 pounds. If not defuel (28-22-00) until they are.

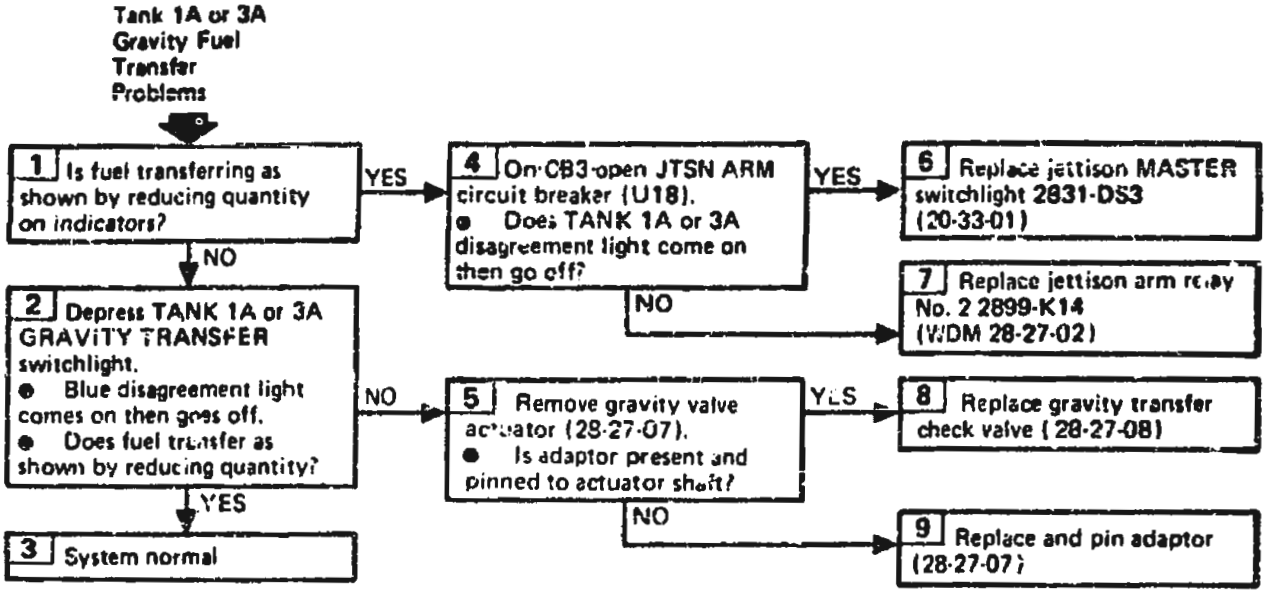
M1-50802-28-1118

Tank 1A or 3A XFR Light Problems
Figure 106

R

EFFECTIVITY: 025-026, 028-999

0028


Tank 1A or 3A Gravity Fuel Transfer Problems
1 Is fuel transferring as shown by reducing quantity on indicators?
YES
NO
2 Depress TANK 1A or 3A GRAVITY TRANSFER switchlight.
● Blue disagreement light comes on then goes off.
● Does fuel transfer as shown by reducing quantity?
YES
NO
3 System normal
4 On CB3 open JTSN ARM circuit breaker (U18).
● Does TANK 1A or 3A disagreement light come on then go off?
YES
NO
5 Remove gravity valve actuator (28-27-07).
● Is adaptor present and pinned to actuator shaft?
YES
NO
6 Replace jettison MASTER switchlight 2831-DS3 (20-33-01)
7 Replace jettison arm relay No. 2 2899-K14 (WDM 28-27-02)
8 Replace gravity transfer check valve (28-27-08)
9 Replace and pin adaptor (28-27-07)

PREREQUISITES

Elec Pwr (24-00-00)
CB's: CB1-H14, H15
Tank 1 or 3 empty, tank 1A or 3A 4000 pounds or more of fuel
FUEL SYSTEM panel:

- TANK 1A or 3A GRAVITY TRANSFER switchlight released, XFR light off, blue disagreement light off
- TANK 1A or TANK 3A quantity switchlight depressed, QTY light on
- 1A XFR or 3A XFR switchlight released, XFR light off
- TANK 1 or 3 boost pumps off

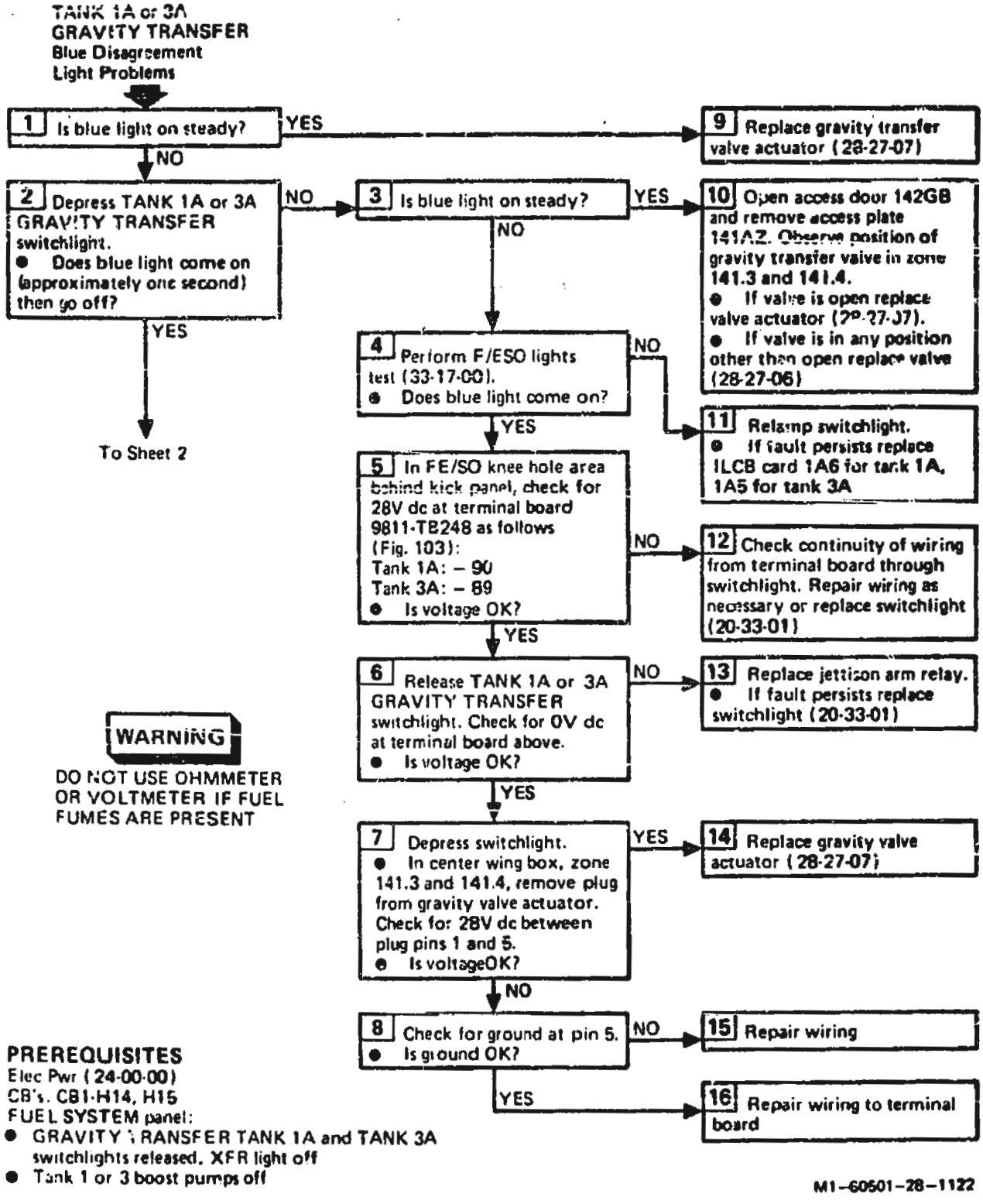
FUEL JETTISON panel:
MASTER switchlight released, OPEN and all blue lights out

M1-50801-28-1120

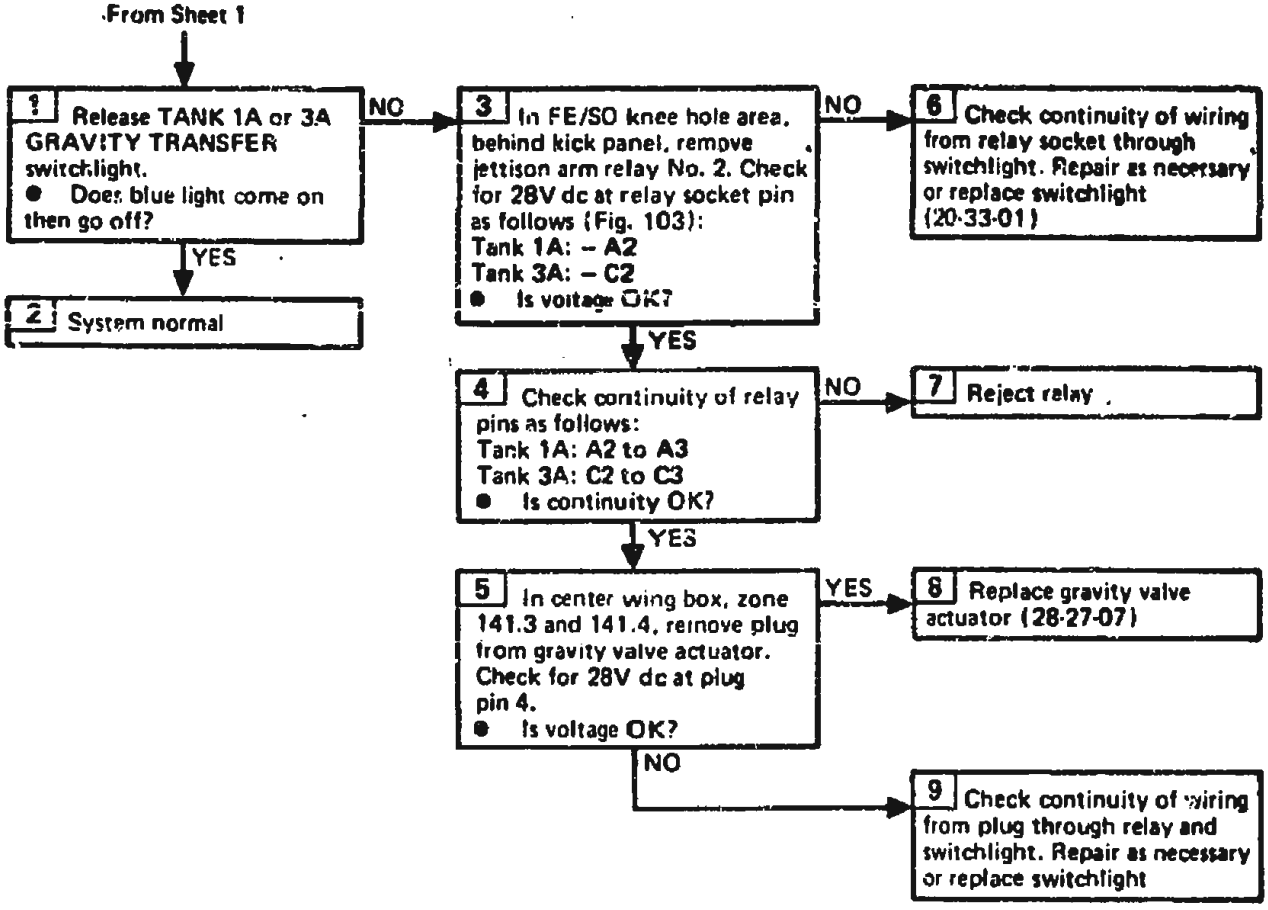
Tank 1A or 3A Gravity Fuel Transfer Problems
Figure 107

R

EFFECTIVITY: 025-026, 028-999

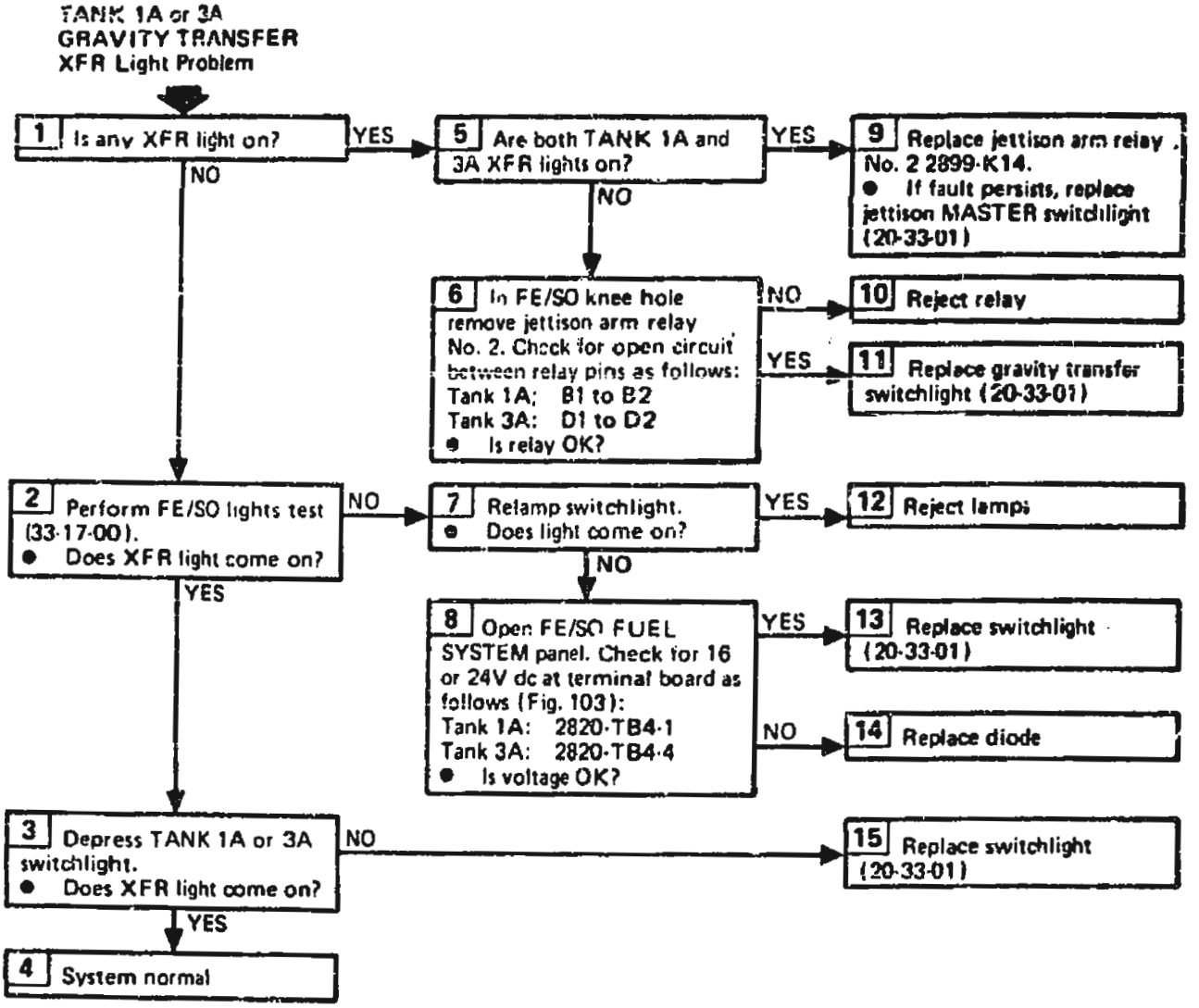

TANK 1A or 3A
GRAVITY TRANSFER
Blue Disagreement
Light Problems
1 Is blue light on steady?
YES
9 Replace gravity transfer valve actuator (28-27-07)
NO
2 Depress TANK 1A or 3A GRAVITY TRANSFER switchlight.
● Does blue light come on (approximately one second) then go off?
NO
3 Is blue light on steady?
YES
10 Open access door 142GB and remove access plate 141AZ. Observe position of gravity transfer valve in zone 141.3 and 141.4.
● If valve is open replace valve actuator (28-27-07).
● If valve is in any position other than open replace valve (28-27-06)
NO
YES
To Sheet 2
4 Perform F/ESO lights test (33-17-00).
● Does blue light come on?
NO
11 Relamp switchlight.
● If fault persists replace ILCB card 1A6 for tank 1A, 1A5 for tank 3A
YES
5 In FE/SO knee hole area behind kick panel, check for 28V dc at terminal board 9811-TB248 as follows (Fig. 103):
Tank 1A: – 90
Tank 3A: – 89
● Is voltage OK?
NO
12 Check continuity of wiring from terminal board through switchlight. Repair wiring as necessary or replace switchlight (20-33-01)
YES
6 Release TANK 1A or 3A GRAVITY TRANSFER switchlight. Check for 0V dc at terminal board above.
● Is voltage OK?
NO
13 Replace jettison arm relay.
● If fault persists replace switchlight (20-33-01)
YES
WARNING
DO NOT USE OHMMETER OR VOLTMETER IF FUEL FUMES ARE PRESENT
7 Depress switchlight.
● In center wing box, zone 141.3 and 141.4, remove plug from gravity valve actuator. Check for 28V dc between plug pins 1 and 5.
● Is voltageOK?
YES
14 Replace gravity valve actuator (28-27-07)
NO
8 Check for ground at pin 5.
● Is ground OK?
NO
15 Repair wiring
YES
16 Repair wiring to terminal board
PREREQUISITES
Elec Pwr (24-00-00)
CB's. C81-H14, H15
FUEL SYSTEM panel:
● GRAVITY TRANSFER TANK 1A and TANK 3A switchlights released. XFR light off
● Tank 1 or 3 boost pumps off
M1-60501-28-1122

R TANK 1A or 3A GRAVITY TRANSFER Blue Disagreement Light Problems
R Figure 108 (Sheet 1)


From Sheet 1
1 Release TANK 1A or 3A GRAVITY TRANSFER switchlight.
● Does blue light come on then go off?
NO
YES
2 System normal
3 In FE/SO knee hole area, behind kick panel, remove jettison arm relay No. 2. Check for 28V dc at relay socket pin as follows (Fig. 103):
Tank 1A: – A2
Tank 3A: – C2
● Is voltage OK?
NO
YES
6 Check continuity of wiring from relay socket through switchlight. Repair as necessary or replace switchlight (20-33-01)
4 Check continuity of relay pins as follows:
Tank 1A: A2 to A3
Tank 3A: C2 to C3
● Is continuity OK?
NO
YES
7 Reject relay
5 In center wing box, zone 141.3 and 141.4, remove plug from gravity valve actuator. Check for 28V dc at plug pin 4.
● Is voltage OK?
YES
NO
8 Replace gravity valve actuator (28-27-07)
9 Check continuity of wiring from plug through relay and switchlight. Repair as necessary or replace switchlight

M1-60500-28-1164

TANK 1A or 3A GRAVITY TRANSFER Blue Disagreement Light Problems
Figure 108 (Sheet 2)

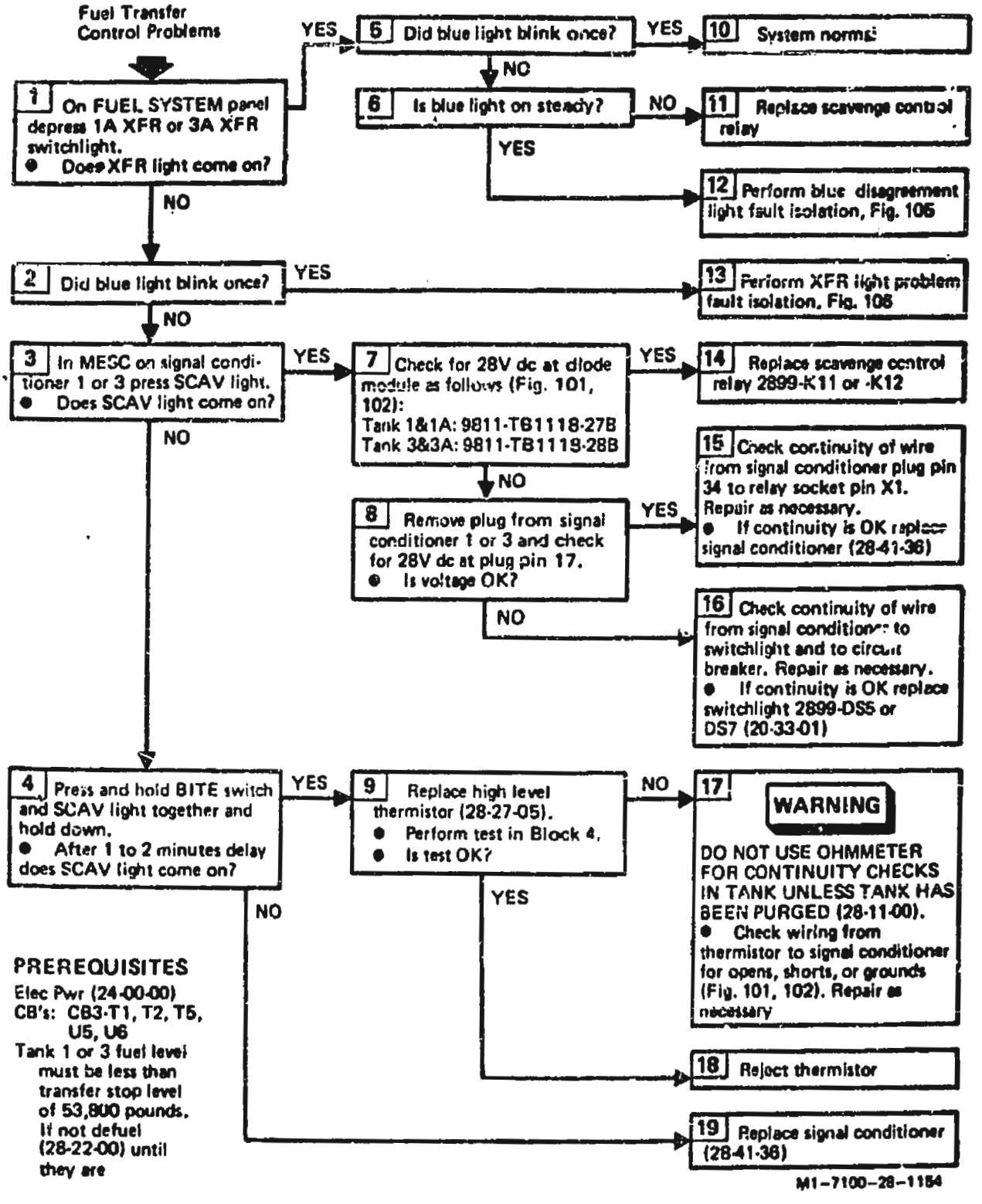

TANK 1A or 3A
GRAVITY TRANSFER
XFR Light Problem
1 Is any XFR light on?
YES
NO
5 Are both TANK 1A and 3A XFR lights on?
YES
NO
9 Replace jettison arm relay No. 2 2899-K14.
● If fault persists, replace jettison MASTER switchlight (20-33-01)
6 In FE/SO knee hole remove jettison arm relay No. 2. Check for open circuit between relay pins as follows:
Tank 1A: B1 to B2
Tank 3A: D1 to D2
● Is relay OK?
NO
10 Reject relay
YES
11 Replace gravity transfer switchlight (20-33-01)
2 Perform FE/SO lights test (33-17-00).
● Does XFR light come on?
NO
7 Relamp switchlight.
● Does light come on?
YES
12 Reject lamps
NO
YES
8 Open FE/SO FUEL SYSTEM panel. Check for 16 or 24V dc at terminal board as follows (Fig. 103):
Tank 1A: 2820-TB4-1
Tank 3A: 2820-TB4-4
● Is voltage OK?
YES
13 Replace switchlight (20-33-01)
NO
14 Replace diode
3 Depress TANK 1A or 3A switchlight.
● Does XFR light come on?
NO
15 Replace switchlight (20-33-01)
YES
4 System normal

PREREQUISITES
Elec Pwr (24-00-00)
CB's. CB1-H14, H15
CB2-H5, J4
FUEL SYSTEM panel:
TANK 1A and 3A GRAVITY TRANSFER switchlights released

M1-60501-28-1123

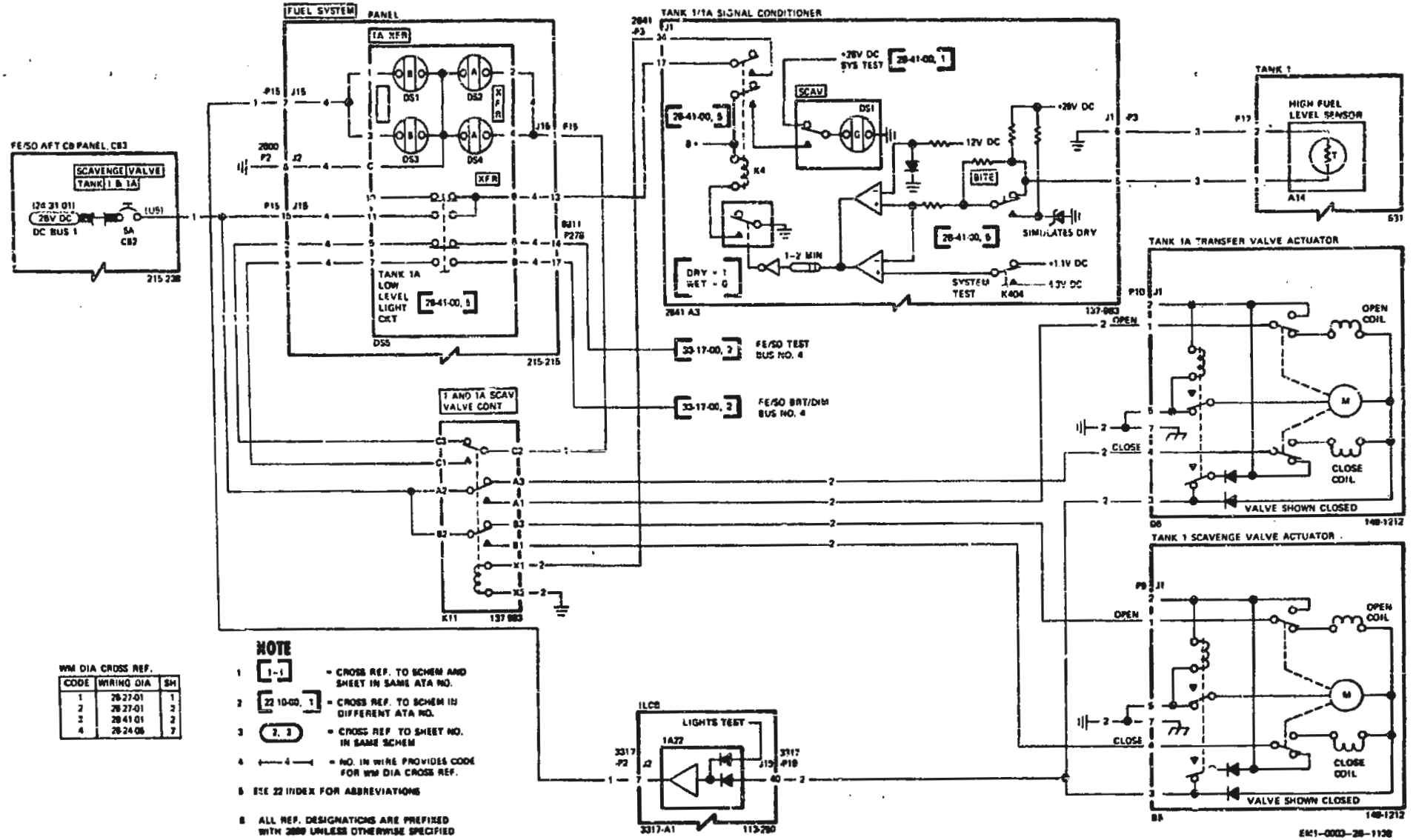
R TANK 1A or 3A GRAVITY TRANSFER XFR Light Problems
R Figure 109

EFFECTIVITY: 025-026, 028-999


Fuel Transfer Control Problems
1 On FUEL SYSTEM panel depress 1A XFR or 3A XFR switchlight.
● Does XFR light come on?
YES
NO
2 Did blue light blink once?
YES
NO
3 In MESC on signal conditioner 1 or 3 press SCAV light.
● Does SCAV light come on?
YES
NO
4 Press and hold BITE switch and SCAV light together and hold down.
● After 1 to 2 minutes delay does SCAV light come on?
YES
NO
5 Did blue light blink once?
YES
NO
10 System normal
6 Is blue light on steady?
NO
YES
11 Replace scavenge control relay
12 Perform blue disagreement light fault isolation, Fig. 105
13 Perform XFR light problem fault isolation, Fig. 106
7 Check for 28V dc at diode module as follows (Fig. 101, 102):
Tank 1&1A: 9811-TB1118-27B
Tank 3&3A: 9811-TB1119-28B
YES
NO
14 Replace scavenge control relay 2899-K11 or -K12
8 Remove plug from signal conditioner 1 or 3 and check for 28V dc at plug pin 17.
● Is voltage OK?
YES
NO
15 Check continuity of wire from signal conditioner plug pin 34 to relay socket pin X1. Repair as necessary.
● If continuity is OK replace signal conditioner (28-41-36)
16 Check continuity of wire from signal conditioner to switchlight and to circuit breaker. Repair as necessary.
● If continuity is OK replace switchlight 2899-DS5 or DS7 (20-33-01)
9 Replace high level thermistor (28-27-05).
● Perform test in Block 4.
● Is test OK?
NO
YES
17 WARNING
DO NOT USE OHMMETER FOR CONTINUITY CHECKS IN TANK UNLESS TANK HAS BEEN PURGED (28-11-00).
● Check wiring from thermistor to signal conditioner for opens, shorts, or grounds (Fig. 101, 102). Repair as necessary
18 Reject thermistor
19 Replace signal conditioner (28-41-36)
PREREQUISITES
Elec Pwr (24-00-00)
CB's: CB3-T1, T2, T5, U5, U6
Tank 1 or 3 fuel level must be less than transfer stop level of 53,800 pounds. If not defuel (28-22-00) until they are
M1-7100-28-1154

R
R Fuel Transfer Control Problems
Figure 110

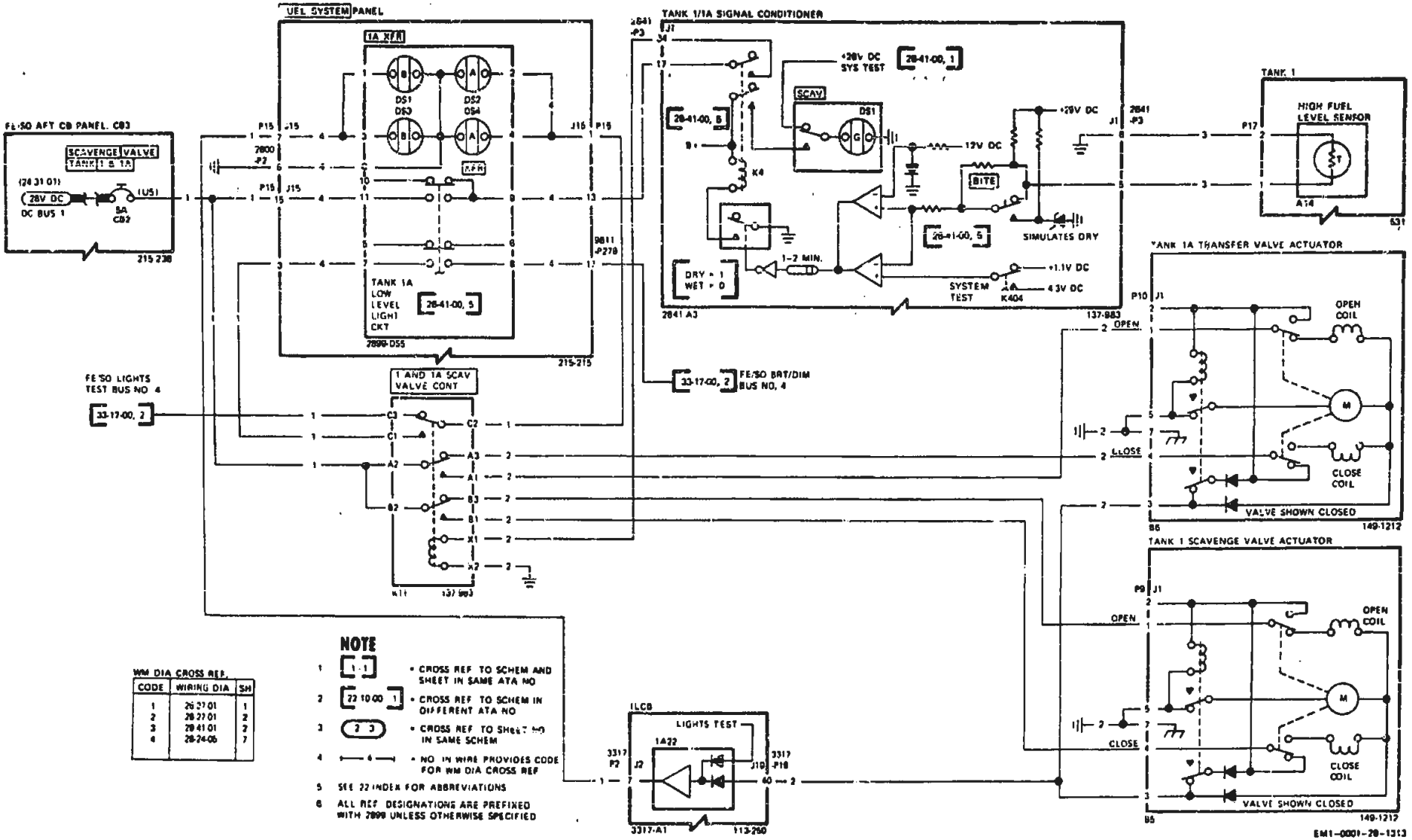
EFFECTIVITY: 025-026, 028-999



R R R Tank 1A Fuel Transfer Tank 1 Scavenge System Schematic
SCHEM 1

R R EFFECTIVITY: 025-026, 028-031 WITHOUT SB28-039 (REV. 5)

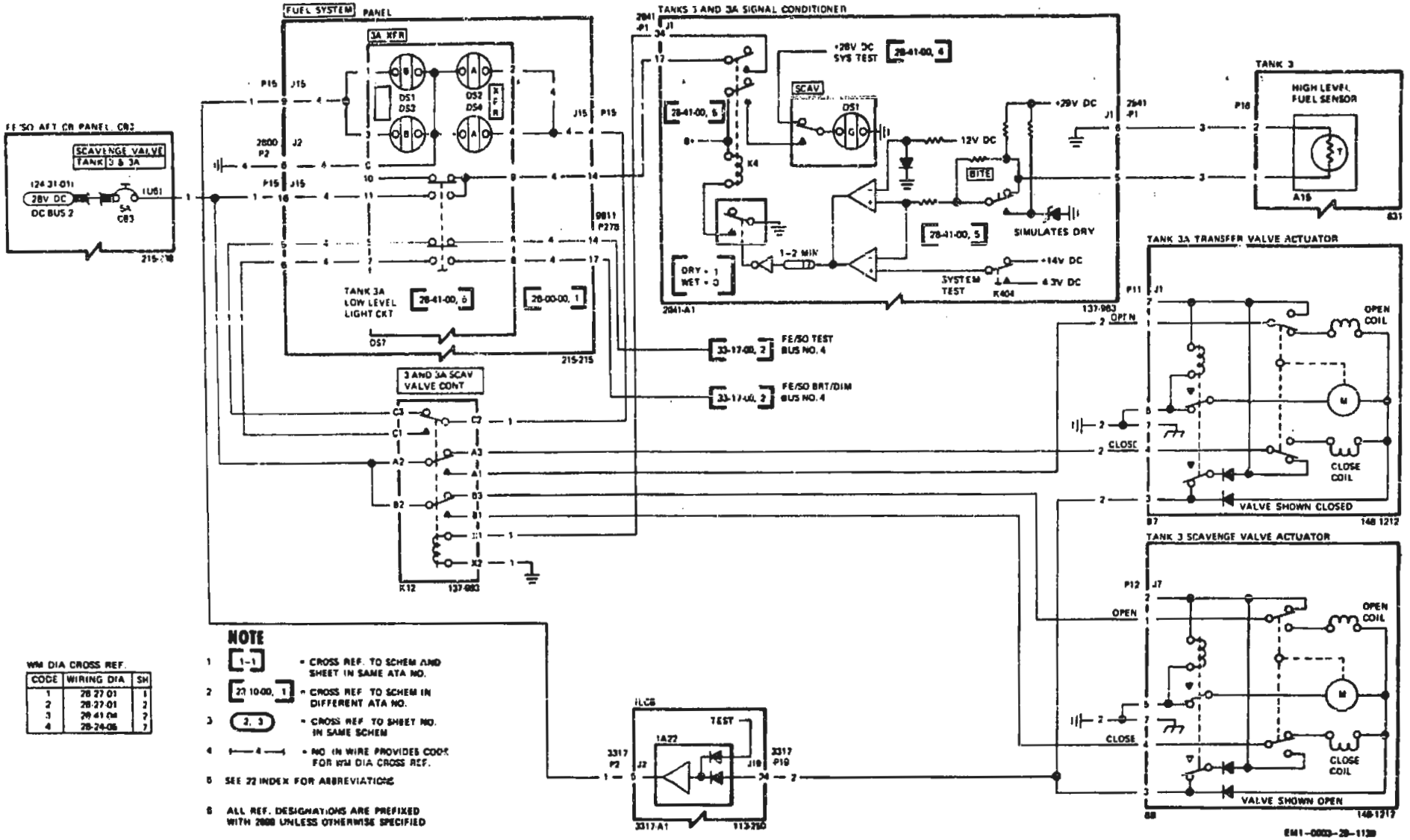
002B



Tank 1A Fuel Transfer Tank 1 Scavenge System Schematic
SCHEM 1

R EFFECTIVITY: 025-026, 028-031 WITH SB28-039
R 032-999 (REV. 5)

0028



WM DIA CROSS REF.

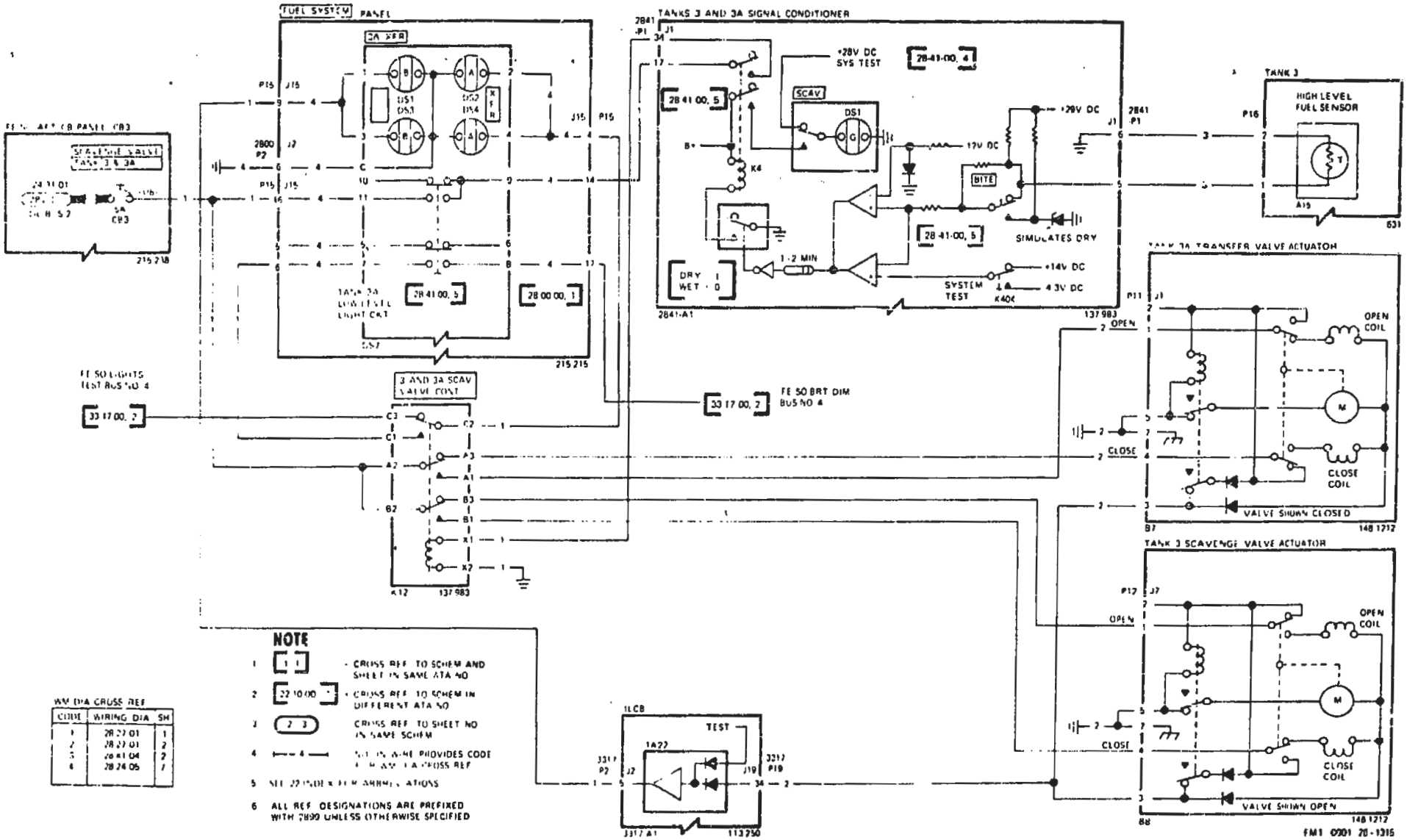
CODE	WIRING DIA	SH
1	28-27-01	1
2	28-27-01	2
3	28-41-00	2
4	28-24-05	2

NOTE

1. [1-1] • CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2. [22-10-00, 1] • CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3. [2, 3] • CROSS REF. TO SHEET NO. IN SAME SCHEM
4. 4 — 4 • NO. IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.
5. SEE 22 INDEX FOR ABBREVIATIONS
6. ALL REF. DESIGNATIONS ARE PREFIXED WITH 2800 UNLESS OTHERWISE SPECIFIED

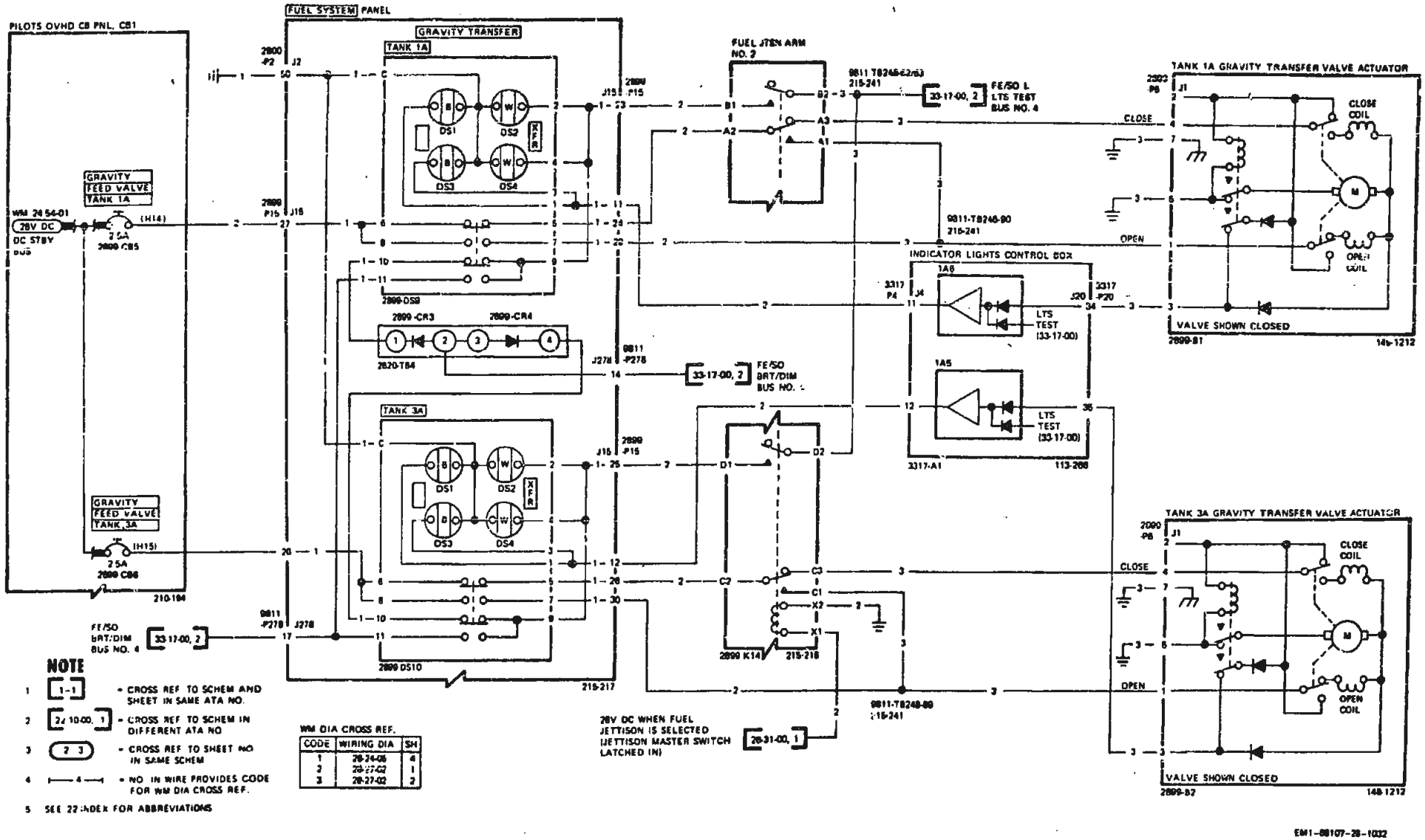
R R R Tank 3A Fuel Transfer Tank 3 Scavenge System Schematic
SCHEM 2

R R EFFECTIVITY: 025-026, 028-031 WITHOUT SB28-039 (REV. 5)



Tank 3A Fuel Transfer Tank 3 Scavenge System Schematic
SCHEM 2

R EFFECTIVITY: 025-026, 028-031 WITH SB28-039
R 032-999 (REV. 5)



NOTE

1. [1-1] - CROSS REF TO SCHEM AND SHEET IN SAME ATA NO.
2. [2 / 10-00, 1] - CROSS REF TO SCHEM IN DIFFERENT ATA NO
3. (2 3) - CROSS REF TO SHEET NO IN SAME SCHEM
4. —4— - NO IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.
5. SEE 22 INDEX FOR ABBREVIATIONS

WM DIA CROSS REF.

CODE	WIRING DIA	SH
1	20-24-06	4
2	20-27-02	1
3	20-27-02	2

Tanks 1A and 3A Gravity Transfer System Schematic
SCHEM 3

R EFFECTIVITY: 025-026, 028-999
R

0028

FUEL TRANSFER SYSTEM - ADJUSTMENT AND TEST

1. General

A. Fuel Transfer (Tank 2L and 2R)

During flight, fuel is retained in the outboard section of tanks 2L and 2R until fuel in the inboard section has dropped to a level equivalent to approximately 1000 lbs (454 Kg). At that time, fuel in the outboard section is automatically transferred, by gravity flow, to the inboard section to replenish fuel drawn from the inboard section surge box by the No. 2 engine fuel feed boost pumps. Fuel transfer occurs through a manifold installed between the outboard compartment and a float-operated valve mounted on the surge box partition.

In operation, the flow of fuel through the valve is automatically modulated to maintain a minimum of approximately 1000 lbs (454 Kg) of fuel in the surge box.

R NOTE: Refer to 28-27-00, Description and Operation, for data describing fuel transfer valve operation.

An operational test procedure for checking tank 2L and 2R fuel transfer is included in Paragraphs B and C.

R B. Tank 1A and 3A Fuel Transfer (Aircraft 025-026, 028-999)

Fuel is normally transferred from each of the 1A and 3A center section tanks to the respective 1 and 3 wing tanks by three large, single-nozzle jet ejector pumps in each tank (Ref. 28-27-00). Motive fuel flow required for jet pump operation is supplied by the fuel boost pumps in tank 1 and 3. Motive flow is routed through electrically actuated 1A and 3A fuel transfer valves controlled by 1A XFR and 3A XFR switches on the FE/SO FUEL SYSTEM panel. In flight, transferred fuel flow rate is augmented by the rate of flow produced by one small single nozzle and one compound jet ejector fuel and condensate scavenge system pump in each tank (Ref. 28-11-00). Motive fuel flow required for scavenge pump operation is also supplied by the respective tank 1 and 3 fuel boost pumps and is controlled by electrically actuated scavenge valves that are automatically opened when the aircraft is airborne. Since the amount of boost pump output that can be diverted for jet pump motive flow purposes is limited, tank 1 and 3 scavenge system motive flow to all but one of the tank 1 and 3 jet pumps is controlled by electrically actuated scavenge valves which

automatically close whenever tank 1A and 3A fuel transfer is selected.

Overfilling of tanks 1 and 3 is prevented by full tank level sensors (thermistors) which provide high and low level R inputs to transfer valve control relay logic in both tank 1/1A and 3/3A fuel quantity system signal conditioners. This circuitry will override the transfer valve select switches to close and, after a one to two minute time delay, reopen the transfer valves.

An operational test procedure for checking out that portion of the tank 1A and 3A fuel transfer function controlled by the 1A and 3A transfer valves is included in Paragraph 3C.

Fuel may also be transferred from each center section tank to its companion 1 or 3 wing tank through electrically actuated tank 1A and 3A gravity transfer valves (provided center section tank fuel level is higher than that in the wing tank). When opened, the valves provide a direct path for center section fuel to dump, through reverse flow check valves, into the adjacent 1 and 3 wing tanks. Both valves are controlled by GRAVITY TRANSFER - 1A and 3A select switches on the FE/SO FUEL SYSTEM panel and are automatically opened when fuel jettison master power is on.

An operational test procedure for checking gravity transfer system operation is included in Paragraph 3D.

2. Referenced Procedures

12-11-11	Underwing Pressure Fueling - Servicing
12-11-21	Gravity Fueling - Servicing
24-00-00	Electrical Power - Maintenance Practices
28-22-00	Defueling - Maintenance Practices
28-24-00	Engine Feed System - Adjustment and Test
28-24-02	Fuel Boost Pump and Motor - Removal and Installation
28-27-00	Fuel Transfer System - Description and Operation

3. Adjustment/Test

CR CR CAUTION: IF BOOST PUMP CIRCUIT BREAKER TRIPS, DO NOT RESET UNTIL IT IS VERIFIED THAT THE TRIP IS NOT CAUSED BY FAULTY ELECTRICAL CONNECTOR IN PUMP HOUSING.

A. Fuel Transfer, Tanks 2L and 2R (Tanks Fueled)

(1) Apply electrical power (Ref. 24-00-00).

(2) At the Flight Engineer/Second Officers FUEL SYSTEM panel, zone 215, verify that tanks 2L and 2R each have a minimum of 11,000 lbs (4990 Kg) of fuel.

(3) Depress 2L INBD and 2R INBD switchlights. Verify that each inboard tank quantity (assuming outboard tank is full) is approximately 8500 lbs (3880 Kg) less than the total for that tank.

NOTE: The above steps verify that the fuel transfer valves are closed.

(4) Defuel inboard tanks 2L and 2R either by pumping fuel to an external receiver or by transfer to tanks 1 and 3 (Ref. 28-22-00).

(5) When the 2L INBD and 2R INBD LOW lights on FE/SO panel come on, end fuel transfer and switch off tank 2L and 2R boost pumps (Ref. 28-22-00).

(6) Turn off System Power switch at fueling/defueling panel if switch was turned on in Step 3A(4).

(7) On the FE/SO FUEL SYSTEM panel verify that inboard tank quantities increase to and stabilize at 800 to 1400 lbs (363 to 636 Kg) each.

NOTE: The above step verifies that the float actuated fuel transfer valves are controlling the rate of fuel flow from the outboard tanks to the inboard tanks as required to maintain the noted fuel level.

(8) Release 2L INBD and 2R INBD switchlights.

(9) Remove electrical power (Ref. 24-00-00).

NOTE: The above steps verify that the fuel transfer valves are open and regulating fuel level.

B. Fuel Transfer, Tanks 2L and 2R (Tanks Empty)

(1) Apply electrical power (Ref. 24-00-00).

(2) On the Flight Engineer/Second Officers FUEL SYSTEM panel, zone 215, verify that tank 2L and 2R inboard tank fuel quantity is low enough to turn on the 2L INBD and 2R INBD switch LOW lights.

(3) Start fueling tank 2L and 2R (Ref. 12-11-11). If the overwing gravity fueling method (Ref. 12-11-21) is employed, use only the outboard gravity fill receptacles.

(4) Observe increase in tank 2L and 2R fuel quantities. Verify that 2L INBD and 2R INBD LOW lights go off at approximately 700 lbs (318 Kg).

NOTE: The above step verifies that fuel is being admitted to the inboard tank through open fuel transfer valves.

(5) When fuel quantity is approximately 1600 lbs (725 Kg), proceed as follows:

(a) If fueling through the gravity fill receptacles, depress 2L INBD and 2R INBD switchlights. Verify that 2L and 2R QTY lights come on and that fuel quantity readings decrease and remain at approximately 800 to 1400 lbs (363 to 636 Kg) each.

NOTE: The above result indicates that the fuel transfer valves have closed and all fueling flow is being directed to the outboard tank.

(b) If pressure fueling method is being used, turn off the fueling supply source and place the SYSTEM POWER switch, on the fueling/defueling panel to OFF. Verify that fuel transfer valves are closed [Ref. Step 4(a)].

(6) Release 2L INBD and 2R INBD switchlights.

(7) Remove electrical power (Ref. 24-00-00).

NOTE: The preceding check verifies that the fuel transfer valves open to replenish fuel withdrawn from the tank inboard sections up to the transfer valve closure point of approximately 1000 lbs (453 Kg).

C. Tank 1A and 3A Fuel Transfer (Aircraft 025-026, 028-999)

(1) Apply electrical power (Ref. 24-00-00).

(2) Refuel tanks 1/1A and 3/3A to 48,000 lbs (21,800 Kg) (Ref. 12-11-11).

(3) On pilots overhead circuit breaker panel CB1, zone 210, verify that GRAVITY FEED VALVE - TANK 1A (H14) and 3A (H15) circuit breakers are closed:

On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, verify that the following circuit breakers are closed:

INBD PUMP IND (U1)

INBD BOOST PUMP - TANK 1 (U7) and 3 (U10)

OUTBD BOOST PUMP - 1 (U13), 3 (U14), and IND (U15)

SCAVENGE VALVE TANK - 1&1A and 3&3A (U5 and U6)

FUEL QTY IND - TEST, 1&1A, 2L, 2R, and 3&3A (T1 through T5)

JTSN ARM (U18)

(4) On FE/SO FUEL SYSTEM panel verify REFUEL POWER ON light is off. If light is on press REFUEL PWR switchlight.

(5) Verify that 1A XFR and 3A XFR switchlights are out and XFR lights are off.

(6) Operate tank 1 and 3 boost pumps (Ref. 28-24-00).

(7) Depress (latch) TANK 1A and 3A switchlights. Verify that QTY lights come on and tank 1 and 3 indicators move downscale and hold steady at fuel quantity in tank 1A and 3A.

(8) Depress (latch) 1A XFR and 3A XFR switchlights. Verify that:

(a) XFR lights come on.

(b) Blue valve-in-transit lights come on (approximately one second), then go off.

(c) Tank 1A and 3A fuel quantities reduce at approximately 400 lbs (180 Kg) per minute.

(d) In MLG wheel wells, tank 1 and 3 scavenge valves have closed. (Actuator override lever viewed in MLG wheel wells has moved to CLOSED position.

(9) Continue transferring fuel until the full tank sensors (thermistors) terminate fuel transfer. This is indicated when:

(a) 1A XFR and 3A XFR blue valve-in-transit lights come on, then go off.

(b) XFR lights go off.

(c) Tank 1A and 3A fuel quantity stops decreasing.

(d) Tank 1 and 3 scavenge valves have opened. (Actuator override lever has moved to OPEN position).

(10) At right wing fueling/defueling panel, place system power switch to ON position.

(11) Initiate fuel transfer from tanks 1 and 3 to tanks 1A and 3A as follows:

(a) Verify that cross-ship manifold ISOLATION VALVE is closed.

(b) Set tank 1A and 3A indicator fuel shutoff above 58,000 lbs (26,300 Kg).

R (c) Open tank 1 and 3 DEFUEL valves.

(d) Open tank 1A and 3A FUELING valves.

(12) Verify that tank 1A and 3A fuel quantity starts to increase.

(13) Observe 1A XFR and 3A XFR switchlights. In approximately one to two minutes the XFR lights will come on and the valve-in-transit lights will come on, then go off indicating that the transfer valves have opened and fuel is once again transferring into tank 1 and 3.

NOTE: Tank 1 and 3 scavenge valves will close.

(14) When the system responds again as noted in Step (9), depress (unlatch) tank 1A XFR and 3A XFR switchlights to close the transfer valves.

(15) Switch off tank 1 and 3 boost pumps.

(16) At refueling/defueling panel:

R (a) Close tank 1 and 3 DEFUEL and 1A and 3A FUELING valves.

(b) Place SYSTEM POWER switch to OFF position.

(c) Close access door.

(17) Remove electrical power (Ref. 24-00-00).

D. Fuel Transfer, Tanks (Tank 1A and 3A Gravity Flow)

(1) Apply electrical power (Ref. 24-00-00).

(2) Perform Steps 3C(1) and 3C(3).

(3) Note combined tank 1/1A and 3/3A fuel quantity displayed on respective indicators.

(4) Depress (latch) TANK 1A and TANK 3A QTY/LOW switchlights (QTY lights on) and note center section fuel quantities.

(5) Determine amount of fuel in tanks 1 and 3.

(6) Using appropriate tank boost pumps and the defuel and fueling valve control switches on right wing fueling/defueling panel, transfer fuel as required until tank 1A and 3A fuel quantities are approximately 4000 lbs (1800 Kg) and respective tank 1 and 3 fuel load is approximately 1000 lbs (454 Kg).

NOTE: Noted fuel quantities are not strict requirement. Primary intent is to assure that tank 1A and 3A fuel levels are sufficiently higher than tank 1 and 3 levels to observe gravity flow into tank 1 and 3 when gravity valves are opened.

(7) Close defuel and refuel valves and place refueling/defueling panel SYSTEM POWER switch to OFF position.

(8) At FE/SO FUEL SYSTEM panel, zone 215:

(a) Switch off boost pumps.

(b) Depress (latch) GRAVITY TRANSFER - TANK 1A and 3A switchlights. Verify that XFR lights come on and blue valve-in-transit lights come on, then go off.

(9) Verify transfer of fuel from tank 1A and 3A into respective tanks 1 and 3 by observing decrease in tank 1A and 3A fuel quantities.

(10) Depress (unlatch) GRAVITY TRANSFER - TANK 1A and 3A switchlights. Verify XFR lights go off and blue valve-in-transit lights come on, then go off.

(11) Verify that tank 1A and 3A fuel quantity stops decreasing.

(12) At FUEL JETTISON panel, lift guard and depress (latch) MASTER switch. (OPEN light comes on, blue valve-in-transit light on, then off).

(13) Verify that tank 1A and 3A gravity transfer valves open (XFR light off and valve-in-transit light on, then off).

(14) Depress (unlatch) FUEL JETTISON MASTER switch. Verify that tank 1A and 3A gravity transfer valves close by observing same results noted in Steps (10) and (11).

(15) Depress (unlatch) tank 1A and 3A QTY/LOW switchlights.

(16) Turn off electrical power (Ref. 24-00-00).

TANK 2L/2R FUEL TRANSFER VALVE - MAINTENANCE PRACTICES

1. General

Perform the following to verify the affected fuel transfer valve is closed and fuel is being retained in the outboard section of the affected 2L or 2R tank.

2. Referenced Procedures

28-27-00 Fuel Transfer System - Adjustment and Test

3. Procedures

NOTE: This procedure applies only when an aircraft is to be dispatched in accordance with the MEL.

CR A. Gain entry to the applicable 2L or 2R fuel tank and prepare
CR the fuel tank for entry.

CR B. Using .024 or larger brass or stainless steel safety wire,
CR wire the fuel valve float in the "up" position. Wrap the
CR wire around the metal portion of the float and not around
CR the foam portion of the float. Use any available
CR tube/fastener/or fitting above the float valve to secure the
CR upper end of the safety wire.

CR C. Close up the previously opened 2L or 2R tank and return A/C
CR to normal.

R D. Refer to 28-27-00 and verify the status of 2L or 2R float-operated Fuel Transfer Valve.

NOTE: The referenced Adjustment and Test procedure consists of two (2) Operational Tests; one with the affected fuel tanks empty and the other with the fuel tanks fueled but NOT full. Maintenance has the option of selecting the operational test that suits the aircraft status (tanks empty or fueled).

E. Install a placard in a prominent place at the FE/SO station - TANK(S) FLOAT-OPERATED TRANSFER VALVE INOPERATIVE CLOSED.

F. Make appropriate entry in aircraft logbook.

R TANK 2L/2R FUEL TRANSFER VALVE - REMOVAL AND INSTALLATION

1. General

Float-operated fuel transfer valves are mounted on the wing rib webs that form the outboard partitions to tank 2L and 2R surge boxes. The valve body projects through the rib and is mated to the fuel low-level transfer manifold by a Wig-O-Flex coupling.

2. Equipment and Materials

O-ring (Ref. Fig. 401)

Seals, Wig-O-Flex coupling (Ref. Fig. 401)

Lock-wire, Fed Spec Qu-W-390, 0.032-inch diameter, or equivalent

3. Referenced Procedures

28-11-00	Fuel Tank - Maintenance Practices
28-20-01	Wig-O-Flex Coupling - Maintenance Practices
28-22-00	Defueling - Maintenance Practices
28-27-00	Fuel Transfer System - Adjustment and Test
57-33-01	Cover Plates and Access Doors - Removal and Installation

4. Removal/Installation

WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF. 28-11-00).

A. Removal

(1) Defuel tank 2L or 2R (Ref. 28-22-00).

(2) Purge and ventilate fuel tank (Ref. 28-11-00).

(3) Remove wing access covers 532BB and 532CB or 632BB and 632CB if not already removed for tank purging (Ref. 57-33-01).

(4) Gain access to Wig-O-Flex coupling between fuel transfer valve and fuel transfer manifold by entering fuel tank through access hole 532CB or 632CB. Gain access to valve body through access hole 532BB or 632BB.

(5) Disassemble Wig-O-Flex coupling (Ref. 28-20-01).

(6) Disassemble Wig-O-Flex coupling and remove seal, split washer, and body from transfer valve.

CR CAUTION: EXERCISE EXTREME CARE WHEN SEPARATING FLOAT VALVE
CR FLANGE FROM AIRCRAFT STRUCTURE TO PREVENT BENDING
CR THE VALVE FLANGE. DISTORTION OF THE VALVE FLANGE
CR AFFECTS INTERNAL SEALING SURFACES OF THE VALVE
CR BODY.

(7) Remove valve attaching parts and separate valve from rib web.

B. Installation

(1) Thoroughly clean the area that is in contact with transfer valve mounting flange (Ref. 28-11-00).

(2) Install new O-ring in valve mounting flange and place valve in its installed position (Ref. Fig. 401). Secure valve to rib web using bolts, washers, and nuts.

NOTE: Verify valve hinge is at top as shown in Figure 401.

(3) Install Wig-O-Flex coupling body, split washer, and seal on valve body.

(4) Install new Wig-O-Flex seal on fuel transfer manifold and reassemble the coupling (Ref. 28-20-01). Install lock-wire between coupling nut and body.

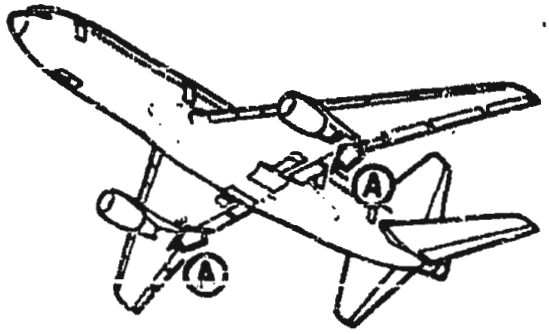
(5) Apply a brush coating of tank sealant (Ref. 28-11-00) to fasteners and wing rib around flange of fuel transfer valve. Allow coating to cure.

(6) Manually move valve float through its range of travel. Verify that float linkage moves freely with no evidence of binding.

(7) Clear tank area of all tools, material, and loose items.

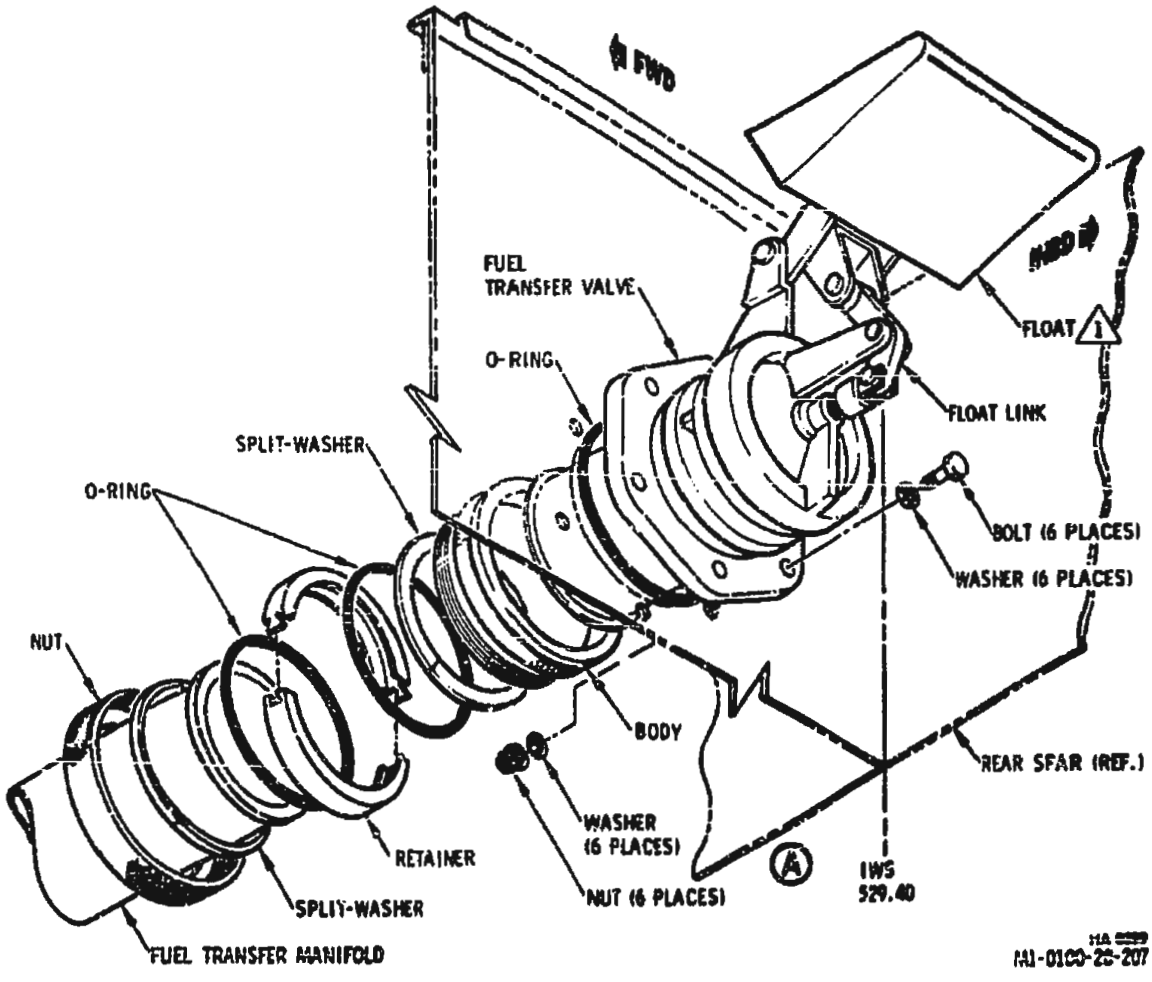
(8) Install access covers removed in Step 4A(3).

(9) Verify operation of fuel transfer valve during refueling (Ref. 28-27-00, Adjustment and Test).



1 NOTE
FLOAT IS SHOWN IN FULL UP (VALVE CLOSED) POSITION

2 TRANSFER VALVE INSTALLATION IN TANK NO. 2R IS SHOWN



Fuel Transfer Valve - Removal and Installation
Figure 401

TANK 1A AND 3A FUEL TRANSFER VALVE - MAINTENANCE PRACTICES

1. General

The following procedure specifies tasks that must be performed to deactivate an inoperative tank 1A or 3A fuel transfer valve.

2. Deactivation

(1) In left or right MLG wheel well, zone 148 or 149, disconnect the electrical harness connector on the applicable tank 1A or 3A transfer valve actuator.

(2) Install protective caps on the wiring harness connector and actuator receptacle. Stow connector.

(3) Position actuator override lever to the CLOSED position.

(4) Add placard to FE/SO FUEL SYSTEM panel, zone 215. Placard must specify which fuel transfer valve is inoperative.

(5) Make appropriate entry in aircraft log book.

TANK 1A AND 3A FUEL TRANSFER VALVE - REMOVAL AND INSTALLATION

1. General

Tank 1A and 3A fuel transfer valves are mounted on the wing center section rear beam. The valve actuators are accessible from the left and right main landing gear wheel wells. Access to the valve body is acquired by removing a wing center section access panel in the hydraulic service center (Ref. 6-50-00).

2. Equipment and Materials

Preformed packing (Ref. Fig. 402)

Lock-wire, Fed Spec QQ-W-390, 0.032-inch diameter, or equivalent

3. Referenced Procedures

6-40-00	Exterior Access Doors and Panels
6-50-00	Interior Access Doors and Removable Panels
12-11-00	Fuel Tank Replenishing - Servicing
24-00-00	Electrical Power System - Maintenance Practices
28-11-00	Fuel Tanks - Maintenance Practices
28-20-01	WIG-O-FLEX Couplings - Maintenance Practices
28-22-00	Defueling - Maintenance Practices
28-24-00	Engine Feed System - Adjustment and Test
32-33-00	Main Landing Gear Inboard Door - Maintenance Practices

4. Removal/Installation

WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF. 28-11-00).

A. Actuator Removal

(1) On Flight Engineer/Second Officers (FE/SO) aft circuit breaker panel CB3, zone 215, open and tag applicable circuit breakers SCAVENGE VALVE TANK 1&1A (U5) or 3&3A (U6) and tank 1 and 3 boost pump circuit breakers U7, U10, U13 and U15.

(2) Open left or right main landing gear inboard door (Ref. 32-33-00).

(3) Locate transfer valve actuator on wing center section rear beam and disconnect electrical harness plug (Ref. Fig. 401).

(4) Remove actuator attach nuts and washers.

(5) Separate actuator from valve body.

(6) Remove adapter retainer and adapter (Ref. Fig. 401). Retain adapter for reinstallation on new actuator.

B. Actuator Installation

(1) Verify that circuit breakers opened in Step 4A(1) are opened and tagged.

(2) Install adapter on actuator output shaft using new retainer. Bend ends of retainer to secure retainer in position (Ref. Fig. 401).

(3) Using actuator override lever, align output shaft adapter with valve shaft and mount actuator on valve body.

(4) Install actuator attach washers and nuts. Tighten nuts 15 to 20 lb in. higher than running torque.

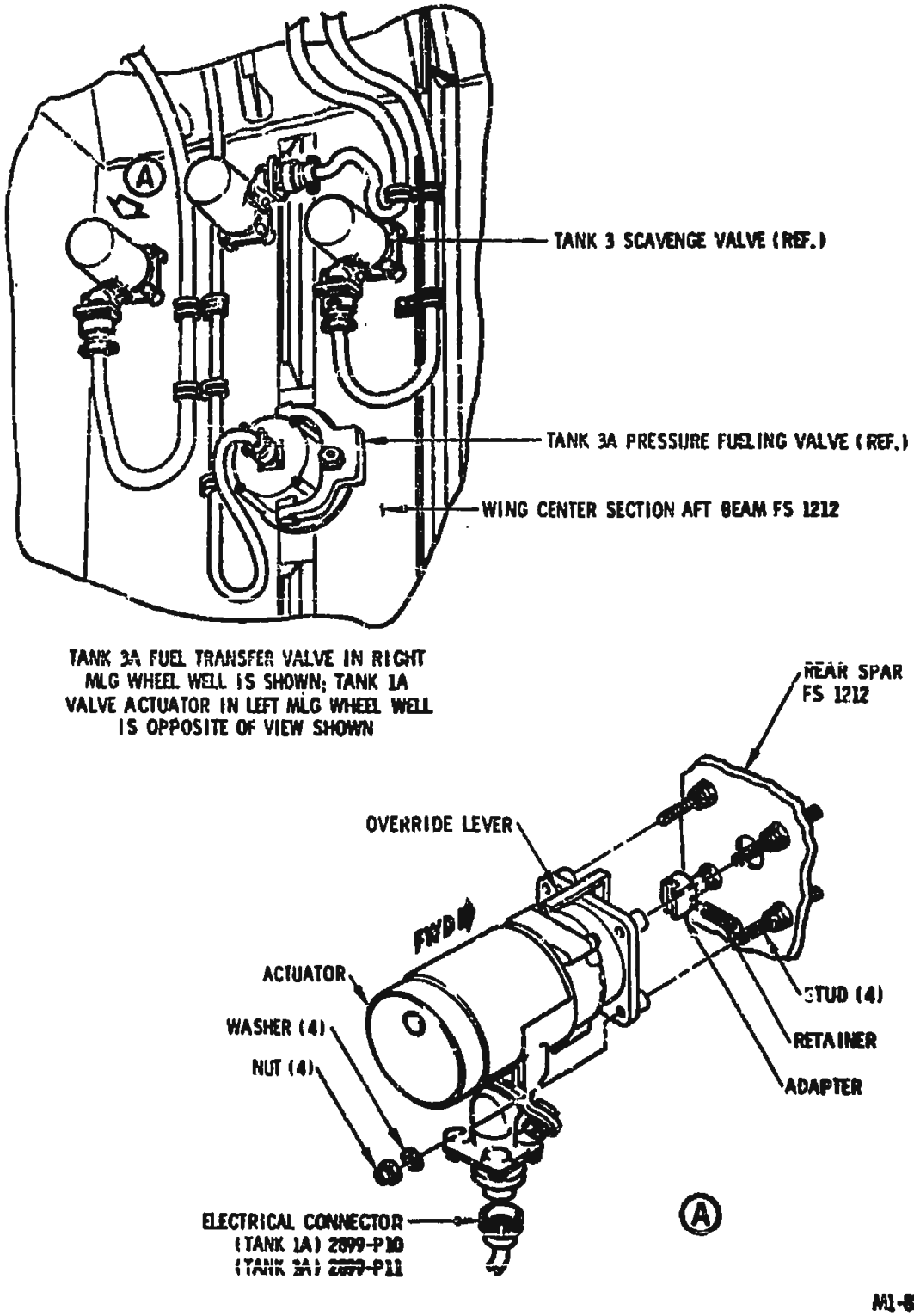
(5) Connect electrical harness plug and add lock-wire.

(6) If not in CLOSED position, move actuator override lever to CLOSED position.

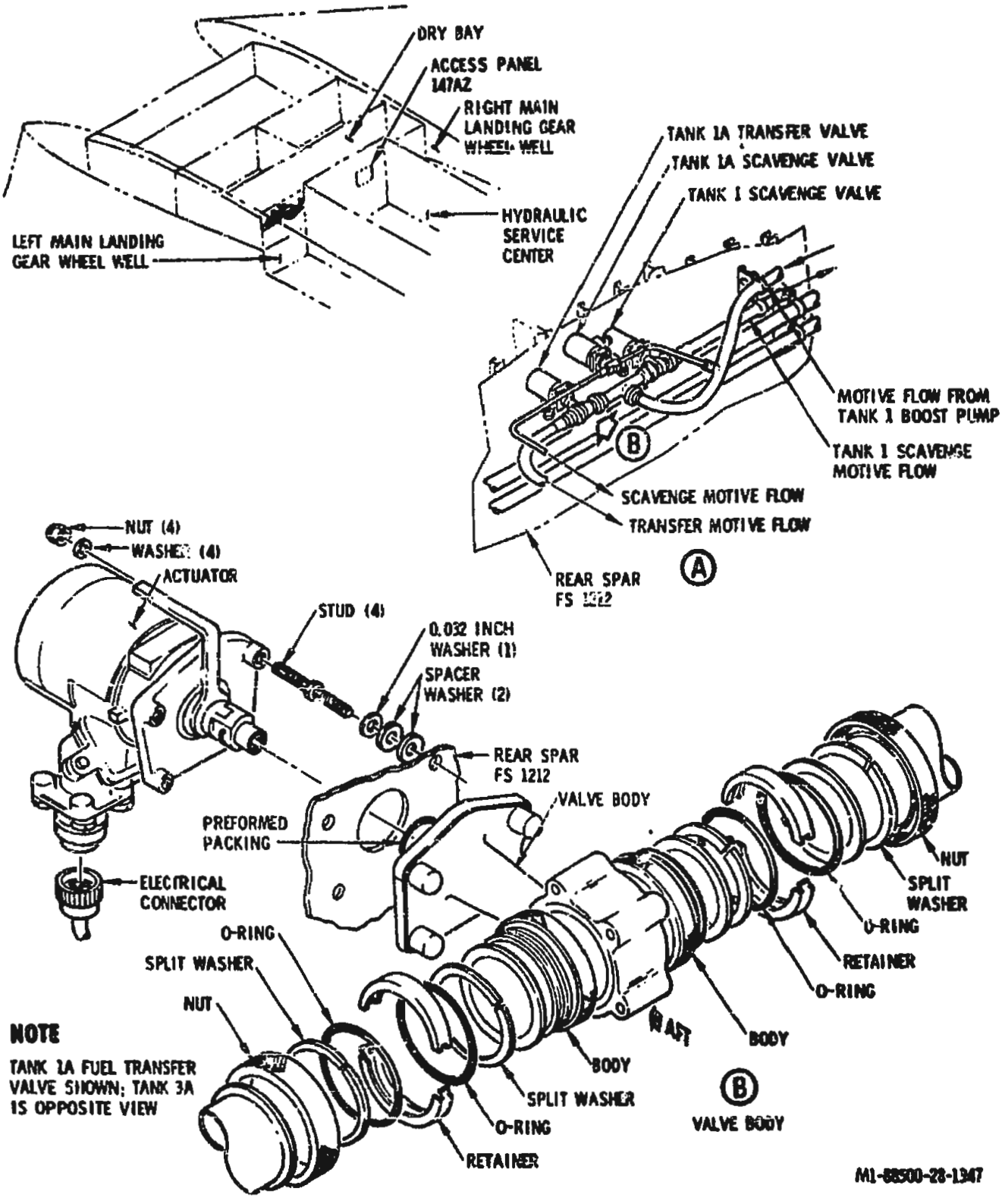
(7) Remove tags and close circuit breakers opened in Step 4A(1).

(8) Apply external electrical power (Ref. 24-00-00).

(9) At Flight Engineer/Second Officers FUEL SYSTEM panel, depress (latch) applicable tank 1A XFR or 3A XFR switch. Verify that blue valve in-transit light comes on (approximately one second) then goes out.



Tank 1A and 3A Fuel Transfer Valve Actuator
Removal and Installation
Figure 401



R Tank 1A and 3A Fuel Transfer Valve Body
R Removal and Installation
R Figure 402

(10) In wheel well, verify actuator override lever has moved from CLOSED to OPEN position.

(11) Depress (unlatch) applicable tank 1A XFR or 3A XFR switch. Verify blue valve in-transit light comes on (approximately one second) then goes out.

(12) Close main landing gear inboard door.

(13) Turn off electrical power (Ref. 24-00-00).

C. Valve Body Removal

(1) Defuel applicable tanks 1 and 1A or 3 and 3A (Ref. 28-22-00).

(2) Remove fuel transfer valve actuator (Ref. Para. 4A).

(3) Gain access to hydraulic service center through access door 147AB (Ref. 6-40-00).

(4) Remove access panel 147AZ on wing center section aft beam (Ref. 6-50-00).

(5) Set up air mover to ventilate center section aft dry bay area (Ref. 28-11-00).

NOTE: Wear an approved respirator while in the dry bay and have a second man stand by in hydraulic service center.

Have container ready to catch residual fuel in fuel transfer.

(6) Enter center section dry bay and disassemble fuel tube couplings (Ref. 28-20-01) at transfer valve body (Ref. Fig. 402).

NOTE: Two spacer washers and a 0.032 inch anti-fretting washer is installed on each valve support stud between the stud hex-head and center section beam. Retain these parts for reinstallation.

(7) Hold valve body while second man in wheel well removes four valve body attach studs.

(8) Remove valve body.

(9) Continue to ventilate area.

D. Valve Body Installation

(1) Verify that air mover set up in Step 4C(4) is in place and operating.

NOTE: Wear an approved respirator while in the dry bay and have a second man stand by in the hydraulic service center.

(2) Insert new preformed packing in valve body mounting surface (Ref. Fig. 402).

(3) Install one 0.032 inch washer and two spacer washers (AN960D416, or equivalent) on each of the four valve body studs.

(4) While man in dry bay holds valve body in its installed position, install four studs. Tighten studs to torque value of 60 to 65 inch lbs.

(5) Reassemble couplings between fuel transfer pipes and valve body (Ref. 28-20-01).

(6) Install actuator (Ref. Para. 4B, Steps 4B(1) through 4B(8).

(7) Partially fill applicable tanks 1 and 1A or 3 and 3A (Ref. 12-11-00).

(8) At Flight Engineer/Second Officers FUEL SYSTEM panel, depress (latch) applicable TANK 1A or 3A QTY switch.

(9) Depress (latch) applicable TANK 1 or 3 PUMPS switch to turn on boost pumps (Ref. 28-24-00).

(10) Depress 1A XFR or 3A XFR switch. Verify blue valve-in-transit light comes on (approximately one second) then goes out.

(11) Check for leaks at valve couplings.

(12) Observe applicable tank 1 or 3 fuel quantity gage. Verify that fuel is transferring from the center section tank to the wing tank.

(13) Depress (unlatch) applicable 1A XFR or 3A XFR switch. Verify that valve-in-transit light comes on, then goes out, and that fuel transfer terminates.

(14) Depress (unlatch) applicable TANK 1A or 3A QTY switch.

(15) Turn off electrical power (Ref. 24-00-00).

(16) Remove tools and equipment from dry bay area and reinstall access panel removed in Step 4C(4).

FUEL TRANSFER PUMP (LARGE SINGLE NOZZLE JET EJECTOR), TANK 1A AND 3A - REMOVAL AND INSTALLATION

1. General

Three jet ejector type fuel transfer pumps are located in each wing center section tank 1A and 3A. Two pumps are mounted on the center section beam that comprises the aft wall of the tank and one is mounted on the wing center tank (BL 0) partition.

2. Equipment and Materials

O-Ring packing (Fig. 401)

3. Referenced Procedures

6-50-00	Interior Access Doors and Removable Panels
12-11-11	Pressure Fueling - Servicing
24-00-00	Electrical Power System - Maintenance Practices
28-11-00	Fuel Tanks - Maintenance Practices
28-20-01	WIG-O-FLEX Couplings - Maintenance Practices
28-22-00	Defueling - Maintenance Practices

4. Removal/Installation

WARNING: OBSERVE ALL FUEL SYSTEM WARNINGS AND PRECAUTIONS (REF. 28-11-00).

A. Removal

(1) Defuel tanks 1A or 3A (Ref. 28-22-00).

(2) On FE/SO FUEL SYSTEM panel release TANK 1 or 3 PUMPS switchlights.

(3) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag following circuit breakers:

INBD BOOST PUMPS (U7, U10)

OUTBD BOOST PUMPS (U13, U14)

SCAVENGE TANK 1A & 3A (U16)

SCAVENGE VALVE TANK 1 & 1A (U5)

SCAVENGE TANK 3 & 3A (U6)

(4) In MLG wheel wells, verify tank 1A and 3A scavenge valve and tank 1A and 3A transfer valve are closed.

(5) Open access doors 142DB, 142GB, and 147AB.

(6) Remove access panels 141AZ and 147AZ (Ref. 6-50-00).

WARNING: PURGING AND VENTILATING OF FUEL TANK IS REQUIRED WHEN PERSONNEL MUST ENTER TANK.

(7) Remove access panels 141.3AZ and 141.7AZ for tank 1A (141.4AZ and 141.8AZ for tank 3A), purge and ventilate tank (Ref. 28-11-00).

(8) Enter tank and locate three large jet pumps (Ref. Fig. 401).

(9) Remove Wiggins couplings (Ref. 28-20-01).

(10) Remove two screws and nuts and remove jet pump.

(11) Remove and discard O-rings.

B. Installation

(1) Verify that circuit breakers opened in Step 4A(3) are open and tagged.

(2) Verify tank ventilation is installed and is operating is in Step 4A(7).

(3) Install jet pump in position (Ref. Fig. 401) and fasten in place with two screws and nuts.

(4) Install Wiggins couplings (Ref. 28-20-01).

(5) Close access panels removed in Step 4A(6).

(6) Close circuit breakers opened in Step 4A(3).

(7) Turn on electrical power (Ref. 24-00-00).

(8) Fill tank 1A or 3A (Ref. 12-11-11). Check for leaks around access panels.

(9) On FE/SO FUEL SYSTEM panel depress appropriate TANK 1A or TANK 3A switchlights. Verify QTY light comes on. Note fuel quantity in tank.

CR CR R CAUTION: IF BOOST PUMP CIRCUIT BREAKER TRIPS, DO NOT RESET UNTIL IT IS VERIFIED THAT CIRCUIT BREAKER TRIP IS NOT CAUSED BY MALFUNCTION IN BOOST PUMP ASSEMBLY.

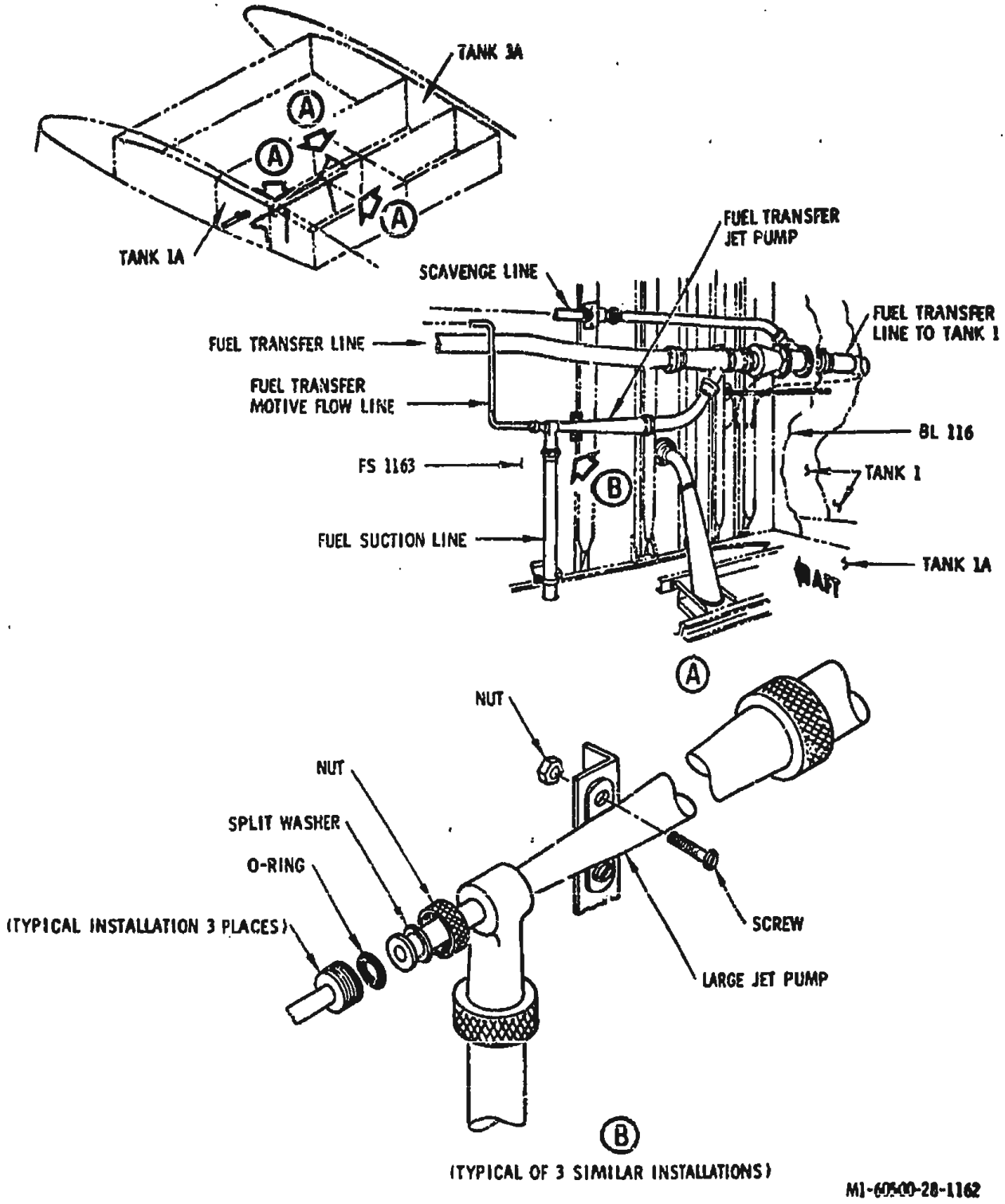
(10) Depress both TANK 1 or 3 PUMPS switchlights. Verify flowbars come on and LOW lights are off.

(11) Depress 1A XFR or 3A XFR switchlights. Verify fuel quantity in tank 1A or 3A is reducing at approximately 400 pounds per minute.

CAUTION: VERIFY ZIPPER DOOR IN AIRFLOW BARRIER IS CLOSED.

(12) Close access doors opened in Step 4A(5).

(13) Turn off electrical power.



Fuel Transfer Jet Pump - Removal and Installation
Figure 401

HIGH LEVEL THERMISTOR - REMOVAL AND INSTALLATION

1. General

The high level thermistor prevents overfilling of tanks 1 and 3 during transfer of fuel from the wing center section tanks 1A and 3A.

2. Referenced Procedures

28-11-00	Fuel Tanks - Maintenance Practice
28-22-00	Defueling System - Maintenance Practice
28-27-00	Fuel Transfer System - Adjustment and Test
57-31-01	Cover Plates and Access Doors - Removal and Installation

3. Removal/Installation

A. Removal

WARNING: VERIFY THAT AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF. 28-11-00).

(1) Verify applicable tank 1 or 3 fuel level is less than 50,000 pounds. Defuel as necessary (Ref. 28-22-00).

(2) On FE/SO aft circuit breaker panel, CB3, zone 215, open and tag the following circuit breakers:

OUTBD BOOST PUMP 1 or 3 (U13, U14)

INBD BOOST PUMP 1 or 3 (U7, U10)

FUEL QTY IND 1 or 3 (T2, T5)

(3) Remove applicable wing access cover 531AT or 631AT (Ref. 57-31-01).

R CAUTION: DO NOT DROP SCREWS OR TOOLS INTO FUEL TANK.

(4) Loosen thermistor captive screws and withdraw thermistor from tank cavity.

(5) Remove two wire attach screws from thermistor. Save screws for reinstallation.

(6) Secure wires to structure with a length of string. Loosen wire clamp screw and remove thermistor.

B. Installation

(1) Verify that circuit breakers opened in Step 3A(2) are open and tagged.

(2) Install wires on thermistor.

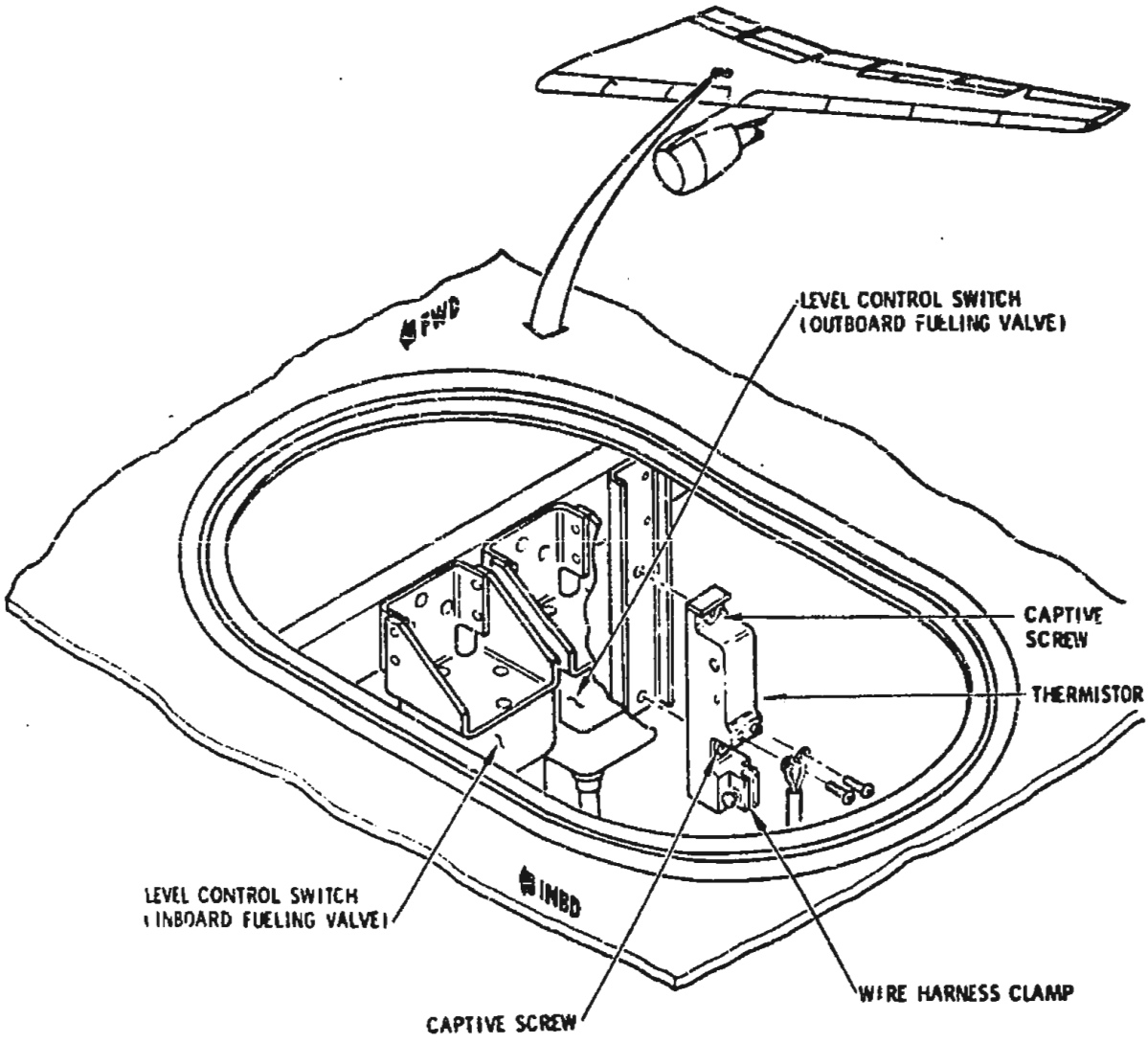
(3) Insert wires in wire clamp and tighten clamp screw.

(4) Place thermistor in position with wire clamp down and tighten captive screws.

(5) Install access cover 531AT or 631AT (Ref. 57-31-01).

(6) Remove tags and close circuit breakers opened in Step 3A(2).

(7) Perform fuselage tank fuel transfer test (Ref. 28-27-00).



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High Level Thermistor - Removal and Installation
Figure 401

GRAVITY TRANSFER VALVE - REMOVAL AND INSTALLATION

1. Equipment and Materials

Seal Washers (valve attach studs)

Packing (valve housing mounting surface)

2. Referenced Procedures

6-40-00	Exterior Access Doors and Panels
24-00-00	Electrical Power System - Maintenance Practices
28-11-00	Fuel Tanks - Maintenance Practices
28-20-01	WIG-O-FLEX Couplings - Maintenance Practices
28-22-00	Defueling - Maintenance Practices
28-27-07	Gravity Transfer Valve Actuator - Removal and Installation

3. Removal/Installation

WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF. 28-11-00).

R A. Removal

(1) Defuel tank to be entered (Ref. 28-22-00).

(2) Open fuselage access doors 142DB and 147AB (Ref. 6-40-00).

(3) Remove access panel 141AZ in wing center section lower surface.

(4) Remove tank access door 141.3AZ or 141.4AZ.

(5) Purge tank (Ref. 28-11-00).

(6) Remove gravity transfer valve actuator (Ref. 28-27-07).

(7) Enter tank and disassemble Wiggins couplings at gravity valve housing (Ref. 28-20-01). Retain tube assembly for installation on new valve body (Ref. Fig. 401).

(8) Using plastic or phenolic scraper, carefully remove sealant fillet at housing-to-spar web faying surface.

(9) Hold valve housing while second man in zone 141.3 or 141.4 removes four housing attach studs.

(10) Remove valve housing from aircraft.

B. Installation

(1) Carefully clean spar web-to-valve housing contact surfaces (Ref. Fig. 401).

(2) Insert new packing in housing mounting surface.

(3) Place one new seal washer on each of four housing attach studs.

(4) While man in tank holds housing in its installed position, install four studs. (Seal washer must be between spar web and hex portion of stud.)Tighten studs to standard torque value for 0.250-inch diameter bolt.

(5) Apply fillet sealant around edge of housing mounting flange (Ref. 28-11-00, Para. 5).

(6) Reassemble Wiggins couplings to connect tube assemblies to valve body (Ref. 28-20-01).

(7) Reinstall tank access covers opened in Step 3A(4).

(8) Allow time for fillet sealant to cure (Ref. 28-11-00).

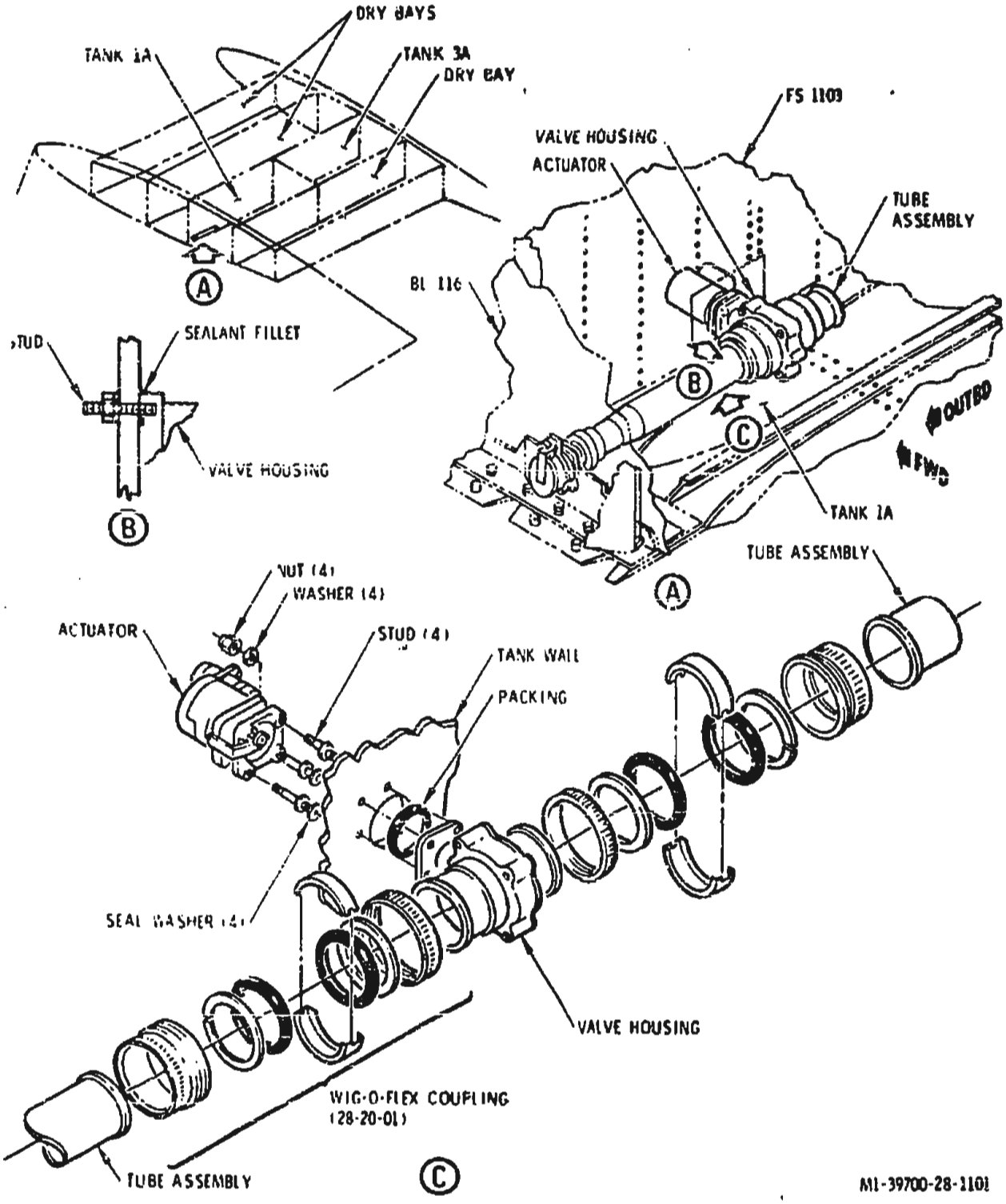
(9) Refuel tank to a level higher than tank 1 or 3 and check for leaks at base of valve.

R (10) Install actuator (Ref. 28-27-07). Do not close access doors or turn off power.

(11) Depress GRAVITY TRANSFER TANK 1A or 3A switchlight.

(12) Verify TANK 1A or 3A QTY light is on. If not, depress switchlight to turn light on.

(13) Observe tank 1 or 3 fuel quantity gage. Verify that reading is reducing to show that fuel is transferring.



Gravity Valve - Removal and Installation
Figure 401

(14) Release GRAVITY TRANSFER TANK 1A or 3A switchlight. Verify blue disagreement light comes on (approximately one second) then goes off.

(15) Verify that fuel stops transferring.

(16) Turn off electrical power (Ref. 24-00-00).

(17) Reinstall access doors and panels opened in Step 3A(2). and (3).

GRAVITY TRANSFER VALVE ACTUATOR - MAINTENANCE PRACTICES

1. General

The following procedure specifies tasks that must be performed to deactivate an inoperative tank 1A or 3A gravity transfer valve.

2. Deactivation

NOTE: This deactivation procedure applies only when an aircraft is to be dispatched in accordance with the MEL.

(1) In wing center section box area, zone 141.3 or 141.4, disconnect the electrical harness connector on the gravity transfer valve being deactivated.

(2) Install protective caps on the wiring harness connector and actuator receptacle. Stow connector.

(3) Position actuator over-ride lever to the CLOSED position.

(4) Add placard to FE/SO FUEL SYSTEM panel, zone 215. Placard must specify which gravity transfer valve is inoperative.

(5) Make appropriate entry in aircraft log book.

GRAVITY TRANSFER VALVE ACTUATOR - REMOVAL AND INSTALLATION

1. Equipment and Materials

   Seal washers

2. Referenced Procedures

   6-40-00 Exterior Access Doors and Panels

   24-00-00 Electrical Power - Maintenance Practices

3. Removal/Installation

   A. Removal

      (1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag circuit breakers JTSN ARM (U18).

      On pilots overhead circuit breaker panel CB1, zone 210, open and tag circuit breakers GRAVITY FEED VALVE TANK 1A and 3A (H14 and H15).

      (2) Open fuselage access door 142DB (Ref. 6-40-00).

      (3) Remove access panel 141AZ in wing center section lower surface.

      (4) Locate gravity transfer valve actuator in lower outboard corner of zone 141.3 or 141.4 and disconnect electrical connector (Ref. Fig. 401).

      (5) If not in CLOSED position, move actuator position handle to CLOSED position.

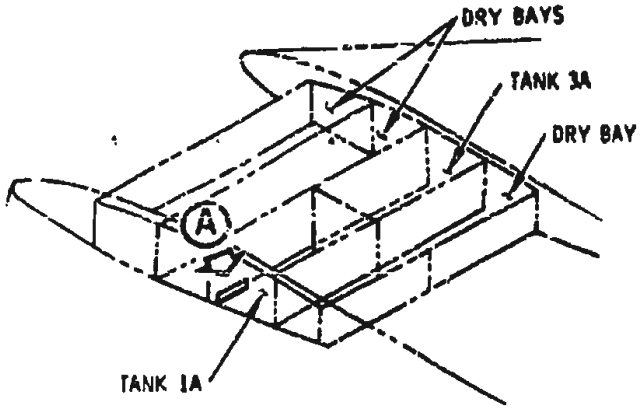
      (6) Remove actuator attach nuts and washers.

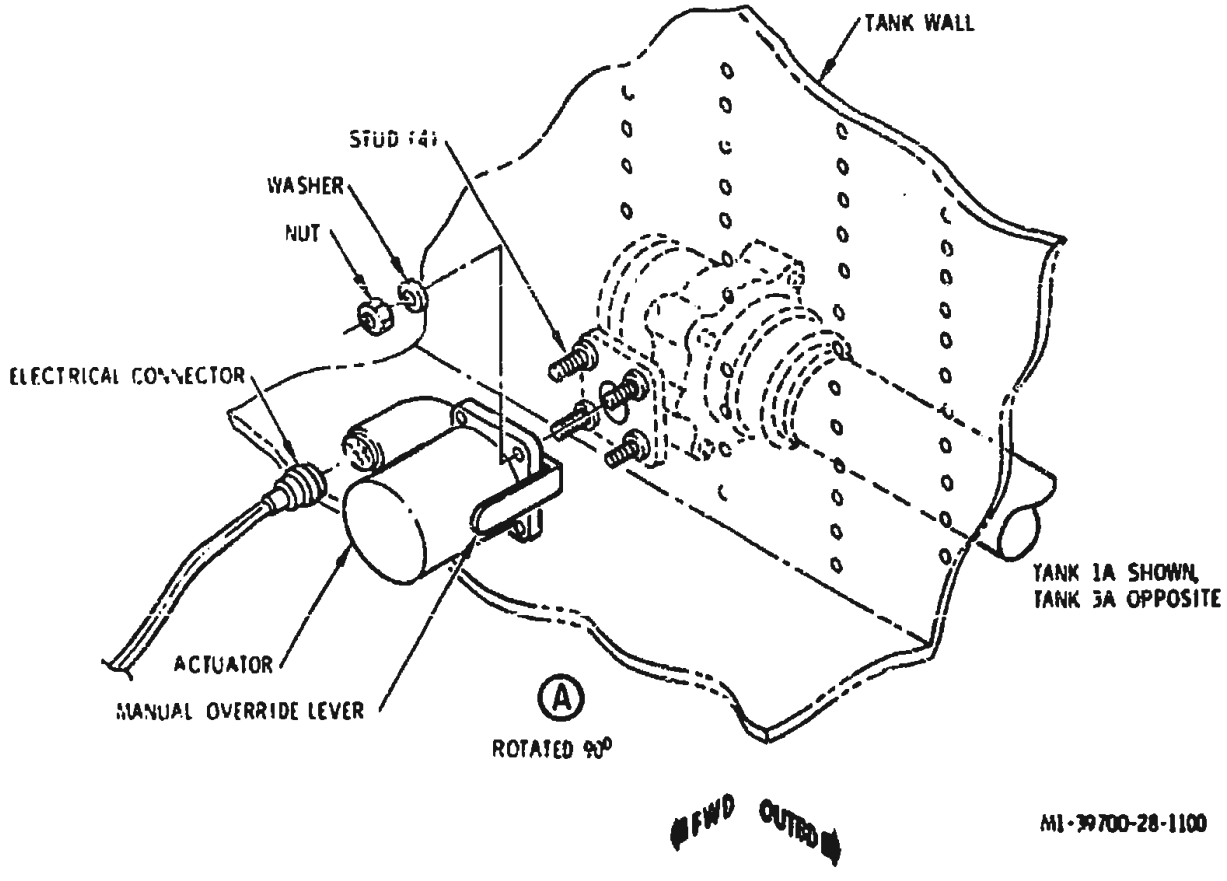
      (7) Separate actuator from valve body.

   B. Installation

      (1) Verify that circuit breakers opened in Step 3A(1) are opened and tagged.

      (2) Verify that actuator position handle is in CLOSED position.





Gravity Valve Actuator - Removal and Installation
Figure 401

(3) Align actuator output shaft with adapter (in valve body) and mount actuator on valve body (Ref. Fig. 401).

(4) Install actuator attach washers and nuts. Tighten nuts 15 to 20 lb in. higher than running torque.

(5) Connect electrical connector.

(6) Remove tags and close circuit breakers opened in Step 3A(1).

(7) Turn on electrical power (Ref. 24-00-00).

(8) On FUEL SYSTEM panel depress GRAVITY TRANSFER TANK 1A or TANK 3A switchlights. Verify blue disagreement light comes on (approximately one second) then goes off.

(9) Release GRAVITY TRANSFER TANK 1A or 3A switchlight. Verify blue disagreement light comes on (approximately one second) then goes off.

(10) Turn off electrical power (Ref. 24-00-00).

(11) Close access panel 141AZ.

(12) Close access door 142DB.

GRAVITY TRANSFER FLAPPER CHECK VALVE - REMOVAL AND INSTALLATION

1. General

The gravity transfer flapper check valves for tanks 1A and 3A are located in tanks 1 and 3. They are outboard of the wing root web at Bl. 116 and inboard of the wing rib at inner wing station 188. Access to the valves is gained through the wing tanks 1 and 3.

2. Referenced Procedures

12-11-11	Pressure Fueling - Servicing
24-00-00	Electrical Power - Maintenance Practices
28-11-00	Fuel Tanks - Maintenance Practices
28-22-00	Defueling - Maintenance Practices
57-33-01	Access Cover Plates and Doors - Removal and Installation

3. Removal/Installation

WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF. 28-11-00).

A. Removal

(1) Defuel tank 1 or 3, as applicable (Ref. 28-22-00).

(2) On Flight Engineers/Second Officers FUEL SYSTEM panel verify GRAVITY TRANSFER TANK 1A or 3A switchlight is released, XFR and blue lights are out, and guards are down.

(3) Verify that 1A XFR or 3A XFR switchlight is released and XFR and blue lights are out.

(4) On FUEL JETTISON panel verify MASTER switchlight is released and guarded, and OPEN and blue lights are off.

(5) Turn off electrical power (Ref. 24-00-00).

(6) Remove wing access cover plate 531AB/631AB for access to tank wing root area inboard of inner wing station 188 (Ref. 57-33-01).

(7) Purge tank (Ref. 28-11-00).

(8) Remove valve body mounting screws and washers (Ref. Fig. 401).

(9) Dislodge valve body from surge box wall by breaking faying surface sealant bond between valve body and tube assembly.

B. Installation

(1) Throughly clean old sealant from tube assembly faying surface.

(2) Apply thin coating of faying surface sealant (Ref. 28-11-00, Para. 5) to the valve body faying surface (Ref. Fig. 401). Mount valve on tube assembly and wet install screws, and washers. Tighten fasteners equally and only as necessary to seat valve body. (Unequal tension or overtorqueing of fasteners could distort valve body and impair proper seating of flapper on valve body seat.)

(3) Apply thin brush coating of sealant over the fasteners.

(4) Check flapper for free movement and contact with all edges of the valve body seat. Be certain there is no sealant on the valve contact surfaces or hinge.

(5) Remove all tools and debris from work area.

(6) Allow sufficient time for sealant to cure (Ref. 28-11-00) before fueling tank. Note accelerated cure time possible by applying heat to rework area before vacating tank.

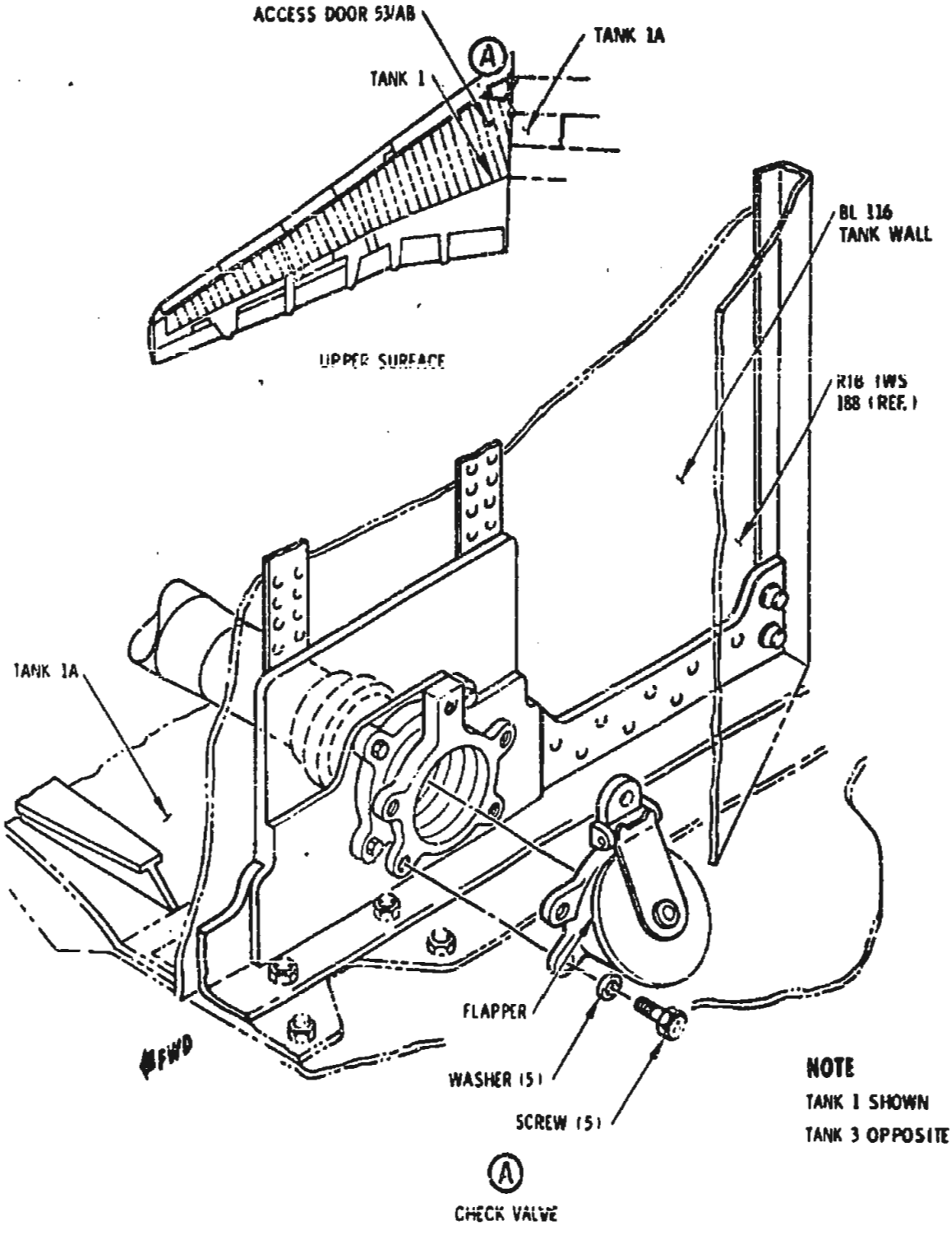
(7) Reinstall tank cover plates (Ref. 57-33-01).

(8) Fill tank 1 or 3 to a level higher than tank 1A or 3A (Ref. 12-11-11).

(9) Depress GRAVITY TRANSFER TANK 1A or 3A switchlight.

(10) Depress TANK 1A or 3A switchlight and verify check valve is not leaking. Fuel quantity will increase if valve is leaking.

(11) Turn off electrical power (Ref. 24-00-00)



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Gravity Transfer Flapper Check Valve - Removal and Installation
Figure 401

FUEL JETTISON SYSTEM - DESCRIPTION AND OPERATION

1. General

In-flight fuel jettisoning (Ref. Fig. 1 and 3) is accomplished by diverting a portion of each tank boost pump output through the tank defuel valves and cross-ship refuel/defuel manifold (Ref. 28-22-00) to fuel jettison valves in each outer wing panel. Fuel is ejected overboard well aft of the wing trailing edge through the opened jettison valve, and jettison masts having flame arrestor equipped nozzles. The operation is controlled by the FE/SO using five guarded switchlights located on the FE/SO FUEL JETTISON panel (Ref. Fig. 1 and 2). If not terminated sooner, fuel jettisoning will be automatically terminated by fuel level sensing thermistors located on fuel quantity transmitter probes No. 3, 9 and 13 (Ref. 28-41-00). At
R the auto-cutoff point, sufficient fuel remains to execute normal
R landing procedures.

2. Fuel Jettison Panel

A. Description and Operation

Fuel jettison system controls are located on the FE/SO FUEL JETTISON panel, zone 215 (Ref. Fig. 2). These controls consist of a MASTER switchlight, two fuel jettison valve in-transit/disagreement lights, and four defuel valve control switches. The above switches are normally in the unlatched (OUT) position and guarded by hinged covers. The function of each switch is described on Figure 2.

NOTE: On aircraft 001-031 with SB28-054, a FLAPS UP ONLY legend on the FUEL JETTISON panel is deleted.

3. Fuel Boost Pump Switches

A. Description and Operation

Eight dual boost pump switches are located on the FE/SO FUEL SYSTEM panel (Ref. 28-24-00). These switches must be depressed (latched in) and the fuel boost pumps operating for fuel jettisoning.

4. Fuel Jettison Valve

A. Description and Operation

One fuel jettison valve is mounted on the aft side of each outer wing panel rear spar at OWS 344.50 (Ref. Fig. 1 and 4). Each valve consists of a housing containing a 2-1/2 inch slide valve, a slide valve actuating yoke mechanism, and mounting provisions for a 28V dc reversible drive actuator.

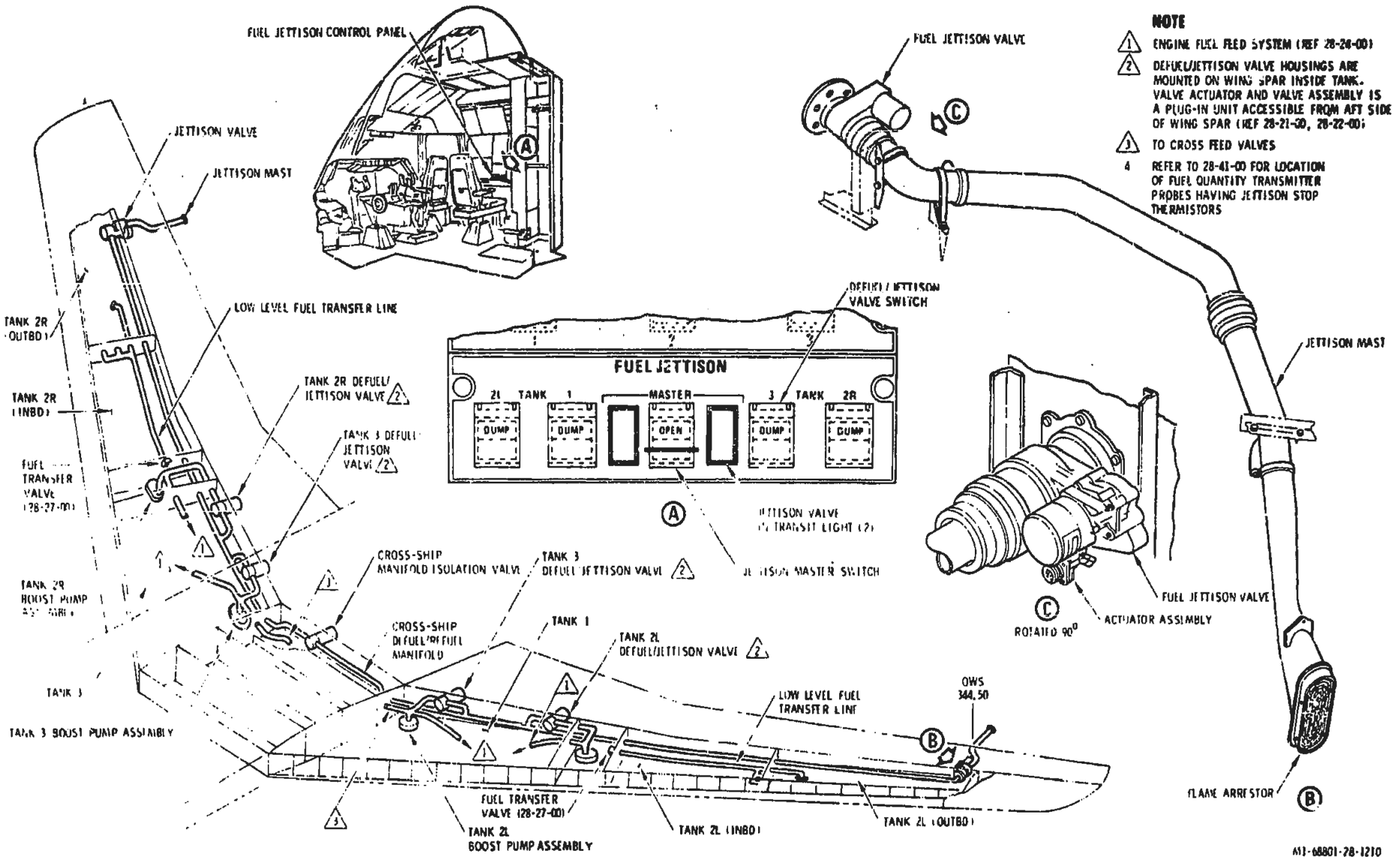
The actuator (Ref. Fig. 4 and 5) contains an integral series-type reversible motor, a gear train, and a roller-type clutch. Cam operated switches limit output shaft rotation to 90 degrees in both clockwise and counterclockwise directions at which point the clutch disengages the actuator output shaft and allows the motor to coast to a stop. An isolation relay is used to prevent operation of the actuator if voltage is applied to the previously energized motor circuit. An output voltage existing at pin 3 of the actuator electrical connector is used to provide a flight station disagreement light indication if the actuator position is not in agreement with the MASTER JETTISON switch position. This circuit remains active whenever the valve is in-transit to provide a flight station indication of valve response to the selected position. A manual override lever, operated by the actuator output shaft, provides a mechanical indication of valve position and may be used to manually operate the valve in either direction.

5. Fuel Level Sensing (Jettison Stop) Thermistors

A. Description and Operation

Automatic termination of fuel jettisoning is controlled by fuel level sensing thermistors in each wing tank. One thermister is attached to fuel quantity transmitter probe No. 3 in the outboard section of tanks 2L and 2R. One is mounted on probe No. 9 in the tank 2L and 2R inboard section, and one is located on probe No. 13 in tanks 1 and 3 (Ref. 28-41-00).

Fuel level sensing thermistors (Ref. Fig. 5) are temperature sensitive negative resistance devices which exhibit high or low resistances determined by whether the device is submerged and cooled by fuel or exposed (uncovered). When submerged, thermistor resistance is high; when uncovered, resistance is low. Thermistor resistance is applied as a high or low logic input to the respective tank signal conditioner. The signal conditioner responds to the thermistor resistance logic by either energizing or relaxing an internal relay through which energizing power is applied to the respective defuel valve control relay. During fuel jettisoning, thermistor resistance is high, the relay in the

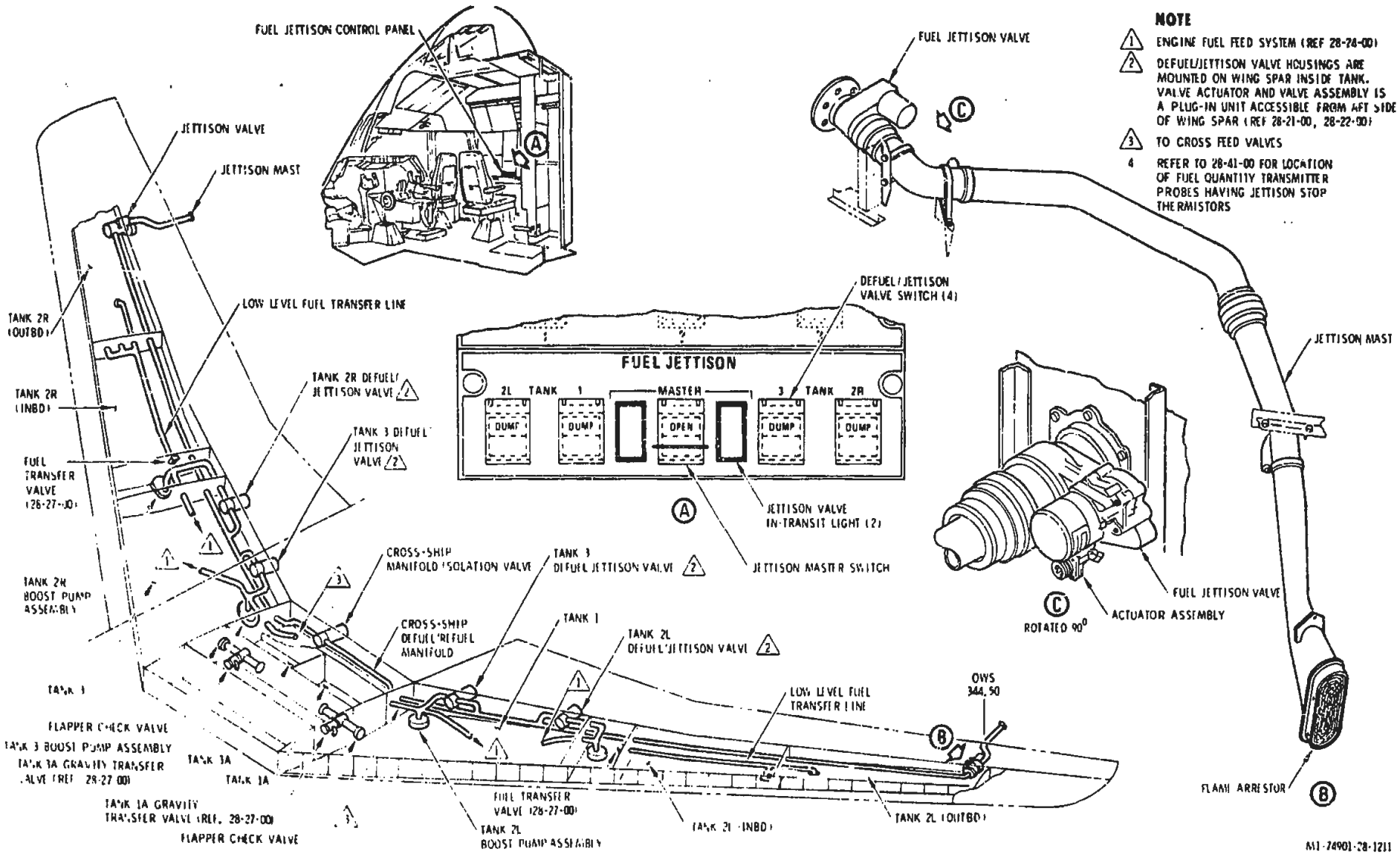

FUEL JETTISON CONTROL PANEL
FUEL JETTISON VALVE
JETTISON VALVE
JETTISON MAST
LOW LEVEL FUEL TRANSFER LINE
TANK 2R (OUTBD)
TANK 2R (INBD)
TANK 2R DEFUEL/ JETTISON VALVE 2
TANK 3 DEFUEL/ JETTISON VALVE 2
FUEL TRANSFER VALVE (28-27-00)
TANK 2R BOOST PUMP
DEFUEL/JETTISON VALVE SWITCH
FUEL JETTISON
2L TANK 1 MASTER 3 TANK 2R
DUMP DUMP OPEN DUMP DUMP
JETTISON VALVE IN TRANSIT LIGHT (2)
JETTISON MASTER SWITCH
CROSS-SHIP MANIFOLD ISOLATION VALVE
TANK 3 DEFUEL JETTISON VALVE 2
CROSS-SHIP DEFUEL/REFUEL MANIFOLD
TANK 1
TANK 2L DEFUEL/JETTISON VALVE 2
TANK 3
TANK 3 BOOST PUMP ASSEMBLY
OWS 344.50
LOW LEVEL FUEL TRANSFER LINE
FUEL TRANSFER VALVE (28-27-00)
TANK 2L BOOST PUMP ASSEMBLY
TANK 2L (INBD)
TANK 2L (OUTBD)
ROTATED 90°
ACTUATOR ASSEMBLY
FUEL JETTISON VALVE
JETTISON MAST
FLAME ARRESTOR
NOTE
1 ENGINE FUEL FEED SYSTEM (REF 28-26-00)
2 DEFUEL/JETTISON VALVE HOUSINGS ARE MOUNTED ON WING SPAR INSIDE TANK. VALVE ACTUATOR AND VALVE ASSEMBLY IS A PLUG-IN UNIT ACCESSIBLE FROM AFT SIDE OF WING SPAR (REF 28-21-50, 28-22-00)
3 TO CROSS FEED VALVES
4 REFER TO 28-41-00 FOR LOCATION OF FUEL QUANTITY TRANSMITTER PROBES HAVING JETTISON STOP THERMISTORS
A11-68801-28-1210

R
R

Fuel Jettison System
Figure 1

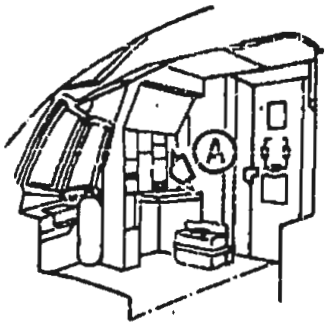
EFFECTIVITY: 001-024, 027

001B

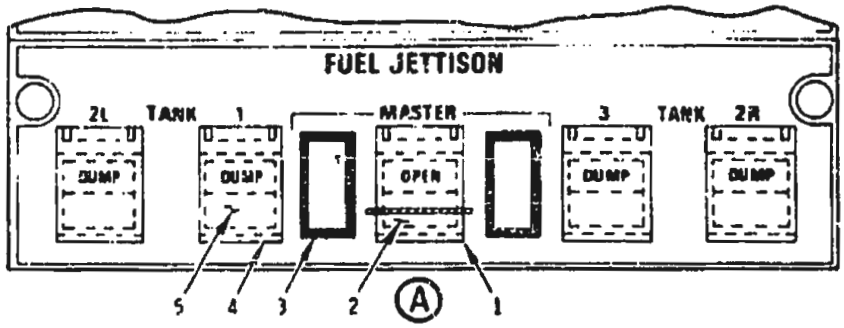

FUEL JETTISON CONTROL PANEL
JETTISON VALVE
JETTISON MAST
TANK 2R (OUTBD)
TANK 2R (INBD)
LOW LEVEL FUEL TRANSFER LINE
TANK 2R DEFUEL/ JETTISON VALVE 2
TANK 3 DEFUEL/ JETTISON VALVE 2
FUEL TRANSFER VALVE (28-27-00)
TANK 2R BOOST PUMP ASSEMBLY
CROSS-SHIP MANIFOLD ISOLATION VALVE
TANK 3 DEFUEL JETTISON VALVE 2
CROSS-SHIP DEFUEL/REFUEL MANIFOLD
TANK 1
TANK 2L DEFUEL/JETTISON VALVE 2
TANK 1
FLAPPER CHECK VALVE
TANK 3 BOOST PUMP ASSEMBLY
TANK 3A GRAVITY TRANSFER VALVE (REF 28-27-00)
TANK 3A
TANK 3A
TANK 1A GRAVITY TRANSFER VALVE (REF. 28-27-00)
FLAPPER CHECK VALVE
FUEL TRANSFER VALVE (28-27-00)
TANK 2L BOOST PUMP ASSEMBLY
TANK 2L (INBD)
TANK 2L (OUTBD)
LOW LEVEL FUEL TRANSFER LINE
OWS 344.50
FUEL JETTISON
2L TANK 1 MASTER 3 TANK 2R
DUMP DUMP OPEN DUMP DUMP
DEFUEL/JETTISON VALVE SWITCH (4)
JETTISON VALVE IN-TRANSIT LIGHT (2)
JETTISON MASTER SWITCH
FUEL JETTISON VALVE
ROTATED 90°
ACTUATOR ASSEMBLY
JETTISON MAST
FLAME ARRESTOR
NOTE
1 ENGINE FUEL FEED SYSTEM (REF 28-24-00)
2 DEFUEL/JETTISON VALVE HOUSINGS ARE MOUNTED ON WING SPAR INSIDE TANK. VALVE ACTUATOR AND VALVE ASSEMBLY IS A PLUG-IN UNIT ACCESSIBLE FROM AFT SIDE OF WING SPAR (REF 28-21-00, 28-22-00)
3 TO CROSS FEED VALVES
4 REFER TO 28-41-00 FOR LOCATION OF FUEL QUANTITY TRANSMITTER PROBES HAVING JETTISON STOP THERMISTORS
M1-74901-28-1211

Fuel Jettison System
Figure 1

R EFFECTIVITY: 025-026, 028-999
R
0018



ZONE 215
FLIGHT ENGINEER/
SECOND OFFICERS STATION



1. JETTISON MASTER SWITCH
   IN (LATCHED) - OPEN LIGHT ON
   - OPENS JETTISON VALVES, CROSS-SHIP MANIFOLD ISOLATION VALVE, AND ELECTRICALLY ARMS THE FOUR FUEL DUMP VALVE SWITCHES.
   OPEN LIGHT ON INDICATES SWITCH IN JETTISON SELECT POSITION.
   OUT (UNLATCHED) - OPEN LIGHT OUT
   - CLOSES JETTISON VALVES, CROSS-SHIP ISOLATION VALVE, AND ELECTRICALLY DISARMS FUEL DUMP VALVE SWITCHES.
2. CROSS-SHIP MANIFOLD ISOLATION VALVE IN-TRANSIT LIGHT
   - BLUE LIGHT ON, THEN OUT, INDICATES VALVE IN-TRANSIT TO OPEN OR CLOSED POSITION. (1)
3. JETTISON VALVE IN-TRANSIT LIGHT
   - BLUE LIGHT ON, THEN OUT, INDICATES VALVE IN-TRANSIT TO OPEN OR CLOSED POSITION. (1)
4. FUEL DUMP VALVE SWITCH
   IN (LATCHED) - DUMP LIGHT ON
   - OPENS FUEL DUMP VALVE. DUMP LIGHT ON INDICATES SWITCH IN VALVE OPEN POSITION.
   OUT (UNLATCHED) - DUMP LIGHT OUT
   - CLOSES DUMP VALVE
5. DUMP VALVE IN-TRANSIT LIGHT
   - BLUE LIGHT ON, THEN OUT, INDICATES VALVE IN-TRANSIT TO OPEN OR CLOSED POSITION. (1)(2)

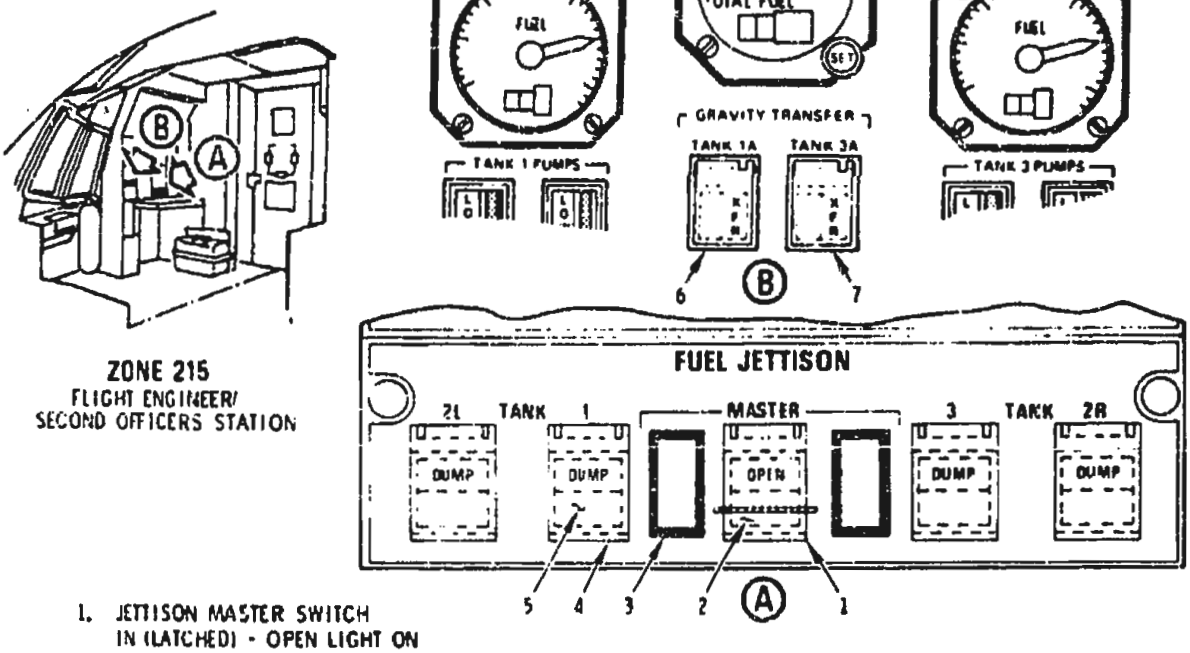
NOTE

(1) (2) BLUE LIGHT REMAINS ON - VALVE IS NOT IN AGREEMENT WITH SELECTED POSITION. IF NOT ALREADY CLOSED, DUMP VALVES WILL CLOSE AT THE AUTOMATIC FUEL JETTISON CUTOFF FUEL LEVELS. IF THE JETTISON MASTER SWITCH IS NOT OUT (UNLATCHED) THE TANK 2L AND 2R DUMP VALVES WILL CYCLE OPEN AND CLOSED

M1-68805-28-039

R
R

Fuel Jettison Panel
Figure 2



1. JETTISON MASTER SWITCH
   IN (LATCHED) - OPEN LIGHT ON
   - OPENS JETTISON VALVES, CROSS-SHIP MANIFOLD ISOLATION VALVE, TANK 1A AND 3A GRAVITY TRANSFER VALVES, AND ELECTRICALLY ARMS THE FOUR FUEL DUMP VALVE SWITCHES. OPEN LIGHT ON INDICATES SWITCH IN JETTISON SELECT POSITION.

   OUT (UNLATCHED) - OPEN LIGHT OUT
   - CLOSES JETTISON VALVES, CROSS-SHIP ISOLATION VALVE, TANK 1A AND 3A GRAVITY TRANSFER VALVES, AND ELECTRICALLY DISARMS FUEL DUMP VALVE SWITCHES.
2. CROSS-SHIP MANIFOLD ISOLATION VALVE IN-TRANSIT LIGHT
   - BLUE LIGHT ON, THEN OFF, INDICATES VALVE IN-TRANSIT TO OPEN OR CLOSED POSITION. (1)
3. JETTISON VALVE IN-TRANSIT LIGHT
   - BLUE LIGHT ON, THEN OFF, INDICATES VALVE IN-TRANSIT TO OPEN OR CLOSED POSITION. (1)
4. FUEL DUMP VALVE SWITCH
   IN (LATCHED) - DUMP LIGHT ON
   - OPENS FUEL DUMP VALVE. DUMP LIGHT ON INDICATES SWITCH IN VALVE OPEN POSITION.

   OUT (UNLATCHED) - DUMP LIGHT OUT
   - CLOSES DUMP VALVE
5. DUMP VALVE IN-TRANSIT LIGHT
   - BLUE LIGHT ON, THEN OFF, INDICATES VALVE IN-TRANSIT TO OPEN OR CLOSED POSITION. (1) (2)
6. GRAVITY TRANSFER VALVE IN-TRANSIT LIGHT
   - BLUE LIGHT ON, THEN OFF INDICATES VALVE IN-TRANSIT TO OPEN OR CLOSED POSITION. (1)
7. GRAVITY TRANSFER VALVE POSITION LIGHT
   - XFR LIGHT ON, VALVE IS OPEN. OFF, VALVE IS CLOSED.

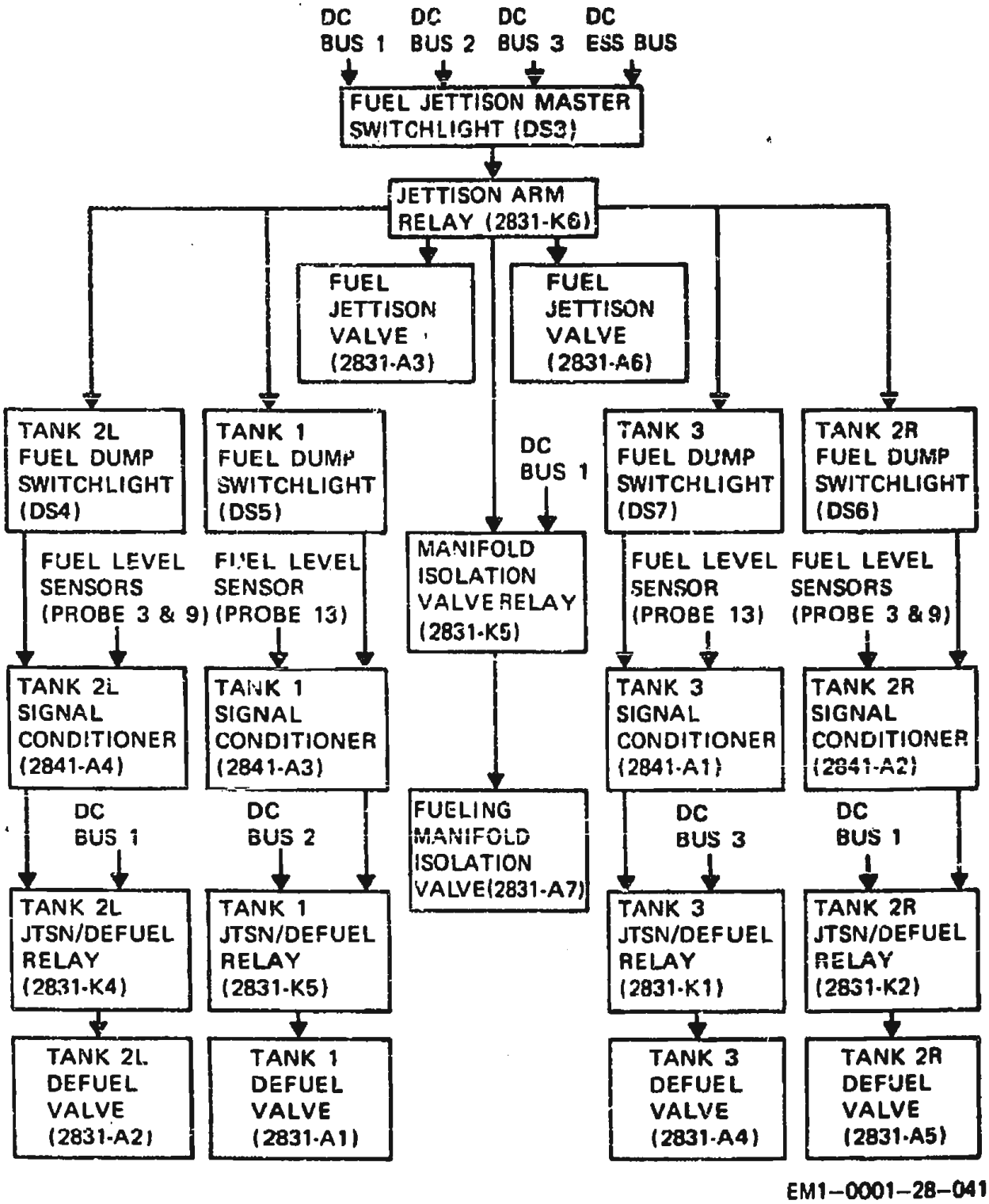
NOTE

(1) BLUE LIGHT REMAINS ON - VALVE IS NOT IN AGREEMENT WITH SELECTED POSITION.

(2) IF NOT ALREADY CLOSED, DUMP VALVES WILL CLOSE AT THE AUTOMATIC FUEL JETTISON CUTOFF FUEL LEVELS. IF THE JETTISON MASTER SWITCH IS NOT OUT (UNLATCHED) THE TANK 2L AND 2R DUMP VALVES WILL CYCLE OPEN AND CLOSED. TANK 1A AND 3A GRAVITY VALVES WILL ALSO CYCLE OPEN AND CLOSE IF THERE IS STILL TRANSFERABLE FUEL IN THE RESPECTIVE 1A 3A TANK.

M1-69801-28-1209

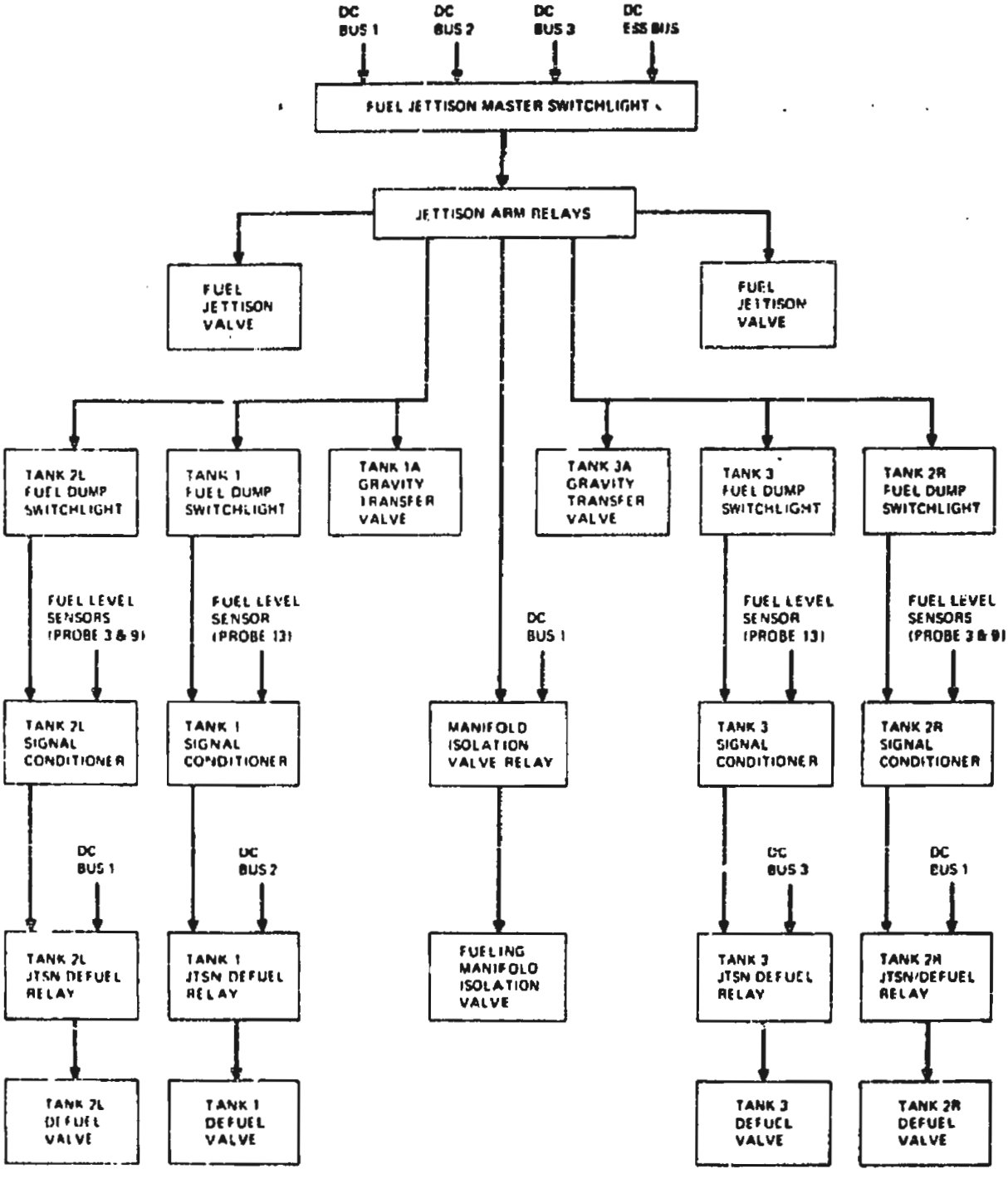
Fuel Jettison Panel
Figure 2


DC BUS 1
DC BUS 2
DC BUS 3
DC ESS BUS
FUEL JETTISON MASTER SWITCHLIGHT (DS3)
JETTISON ARM RELAY (2831-K6)
FUEL JETTISON VALVE (2831-A3)
FUEL JETTISON VALVE (2831-A6)
TANK 2L FUEL DUMP SWITCHLIGHT (DS4)
TANK 1 FUEL DUMP SWITCHLIGHT (DS5)
DC BUS 1
TANK 3 FUEL DUMP SWITCHLIGHT (DS7)
TANK 2R FUEL DUMP SWITCHLIGHT (DS6)
FUEL LEVEL SENSORS (PROBE 3 & 9)
FUEL LEVEL SENSOR (PROBE 13)
MANIFOLD ISOLATION VALVE RELAY (2831-K5)
FUEL LEVEL SENSOR (PROBE 13)
FUEL LEVEL SENSORS (PROBE 3 & 9)
TANK 2L SIGNAL CONDITIONER (2841-A4)
TANK 1 SIGNAL CONDITIONER (2841-A3)
TANK 3 SIGNAL CONDITIONER (2841-A1)
TANK 2R SIGNAL CONDITIONER (2841-A2)
DC BUS 1
DC BUS 2
FUELING MANIFOLD ISOLATION VALVE (2831-A7)
DC BUS 3
DC BUS 1
TANK 2L JTSN/DEFUEL RELAY (2831-K4)
TANK 1 JTSN/DEFUEL RELAY (2831-K5)
TANK 3 JTSN/DEFUEL RELAY (2831-K1)
TANK 2R JTSN/DEFUEL RELAY (2831-K2)
TANK 2L DEFUEL VALVE (2831-A2)
TANK 1 DEFUEL VALVE (2831-A1)
TANK 3 DEFUEL VALVE (2831-A4)
TANK 2R DEFUEL VALVE (2831-A5)

EM1-0001-28-041

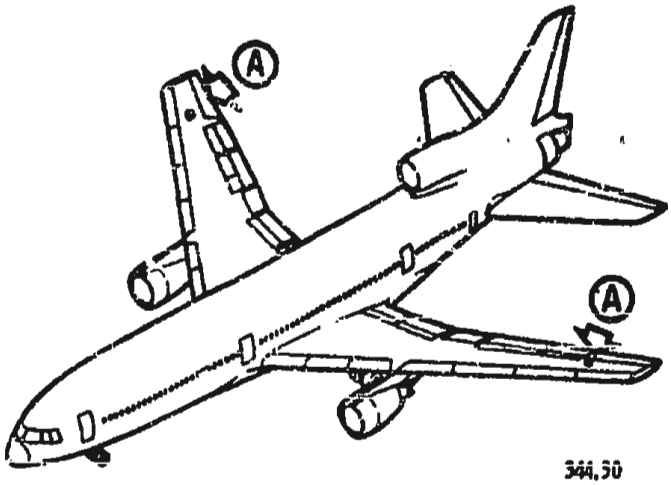
R Fuel Jettison System Block Diagram
R Figure 3

R EFFECTIVITY: 001-024, 027
R
0018


DC BUS 1
DC BUS 2
DC BUS 3
DC ESS BUS
FUEL JETTISON MASTER SWITCHLIGHT
JETTISON ARM RELAYS
FUEL JETTISON VALVE
FUEL JETTISON VALVE
TANK 2L FUEL DUMP SWITCHLIGHT
TANK 1 FUEL DUMP SWITCHLIGHT
TANK 1A GRAVITY TRANSFER VALVE
TANK 3A GRAVITY TRANSFER VALVE
TANK 3 FUEL DUMP SWITCHLIGHT
TANK 2R FUEL DUMP SWITCHLIGHT
FUEL LEVEL SENSORS (PROBE 3 & 9)
FUEL LEVEL SENSOR (PROBE 13)
DC BUS 1
FUEL LEVEL SENSOR (PROBE 13)
FUEL LEVEL SENSORS (PROBE 3 & 9)
TANK 2L SIGNAL CONDITIONER
TANK 1 SIGNAL CONDITIONER
MANIFOLD ISOLATION VALVE RELAY
TANK 3 SIGNAL CONDITIONER
TANK 2R SIGNAL CONDITIONER
DC BUS 1
DC BUS 2
DC BUS 3
DC BUS 1
TANK 2L JTSN DEFUEL RELAY
TANK 1 JTSN DEFUEL RELAY
FUELING MANIFOLD ISOLATION VALVE
TANK 3 JTSN DEFUEL RELAY
TANK 2R JTSN/DEFUEL RELAY
TANK 2L DEFUEL VALVE
TANK 1 DEFUEL VALVE
TANK 3 DEFUEL VALVE
TANK 2R DEFUEL VALVE

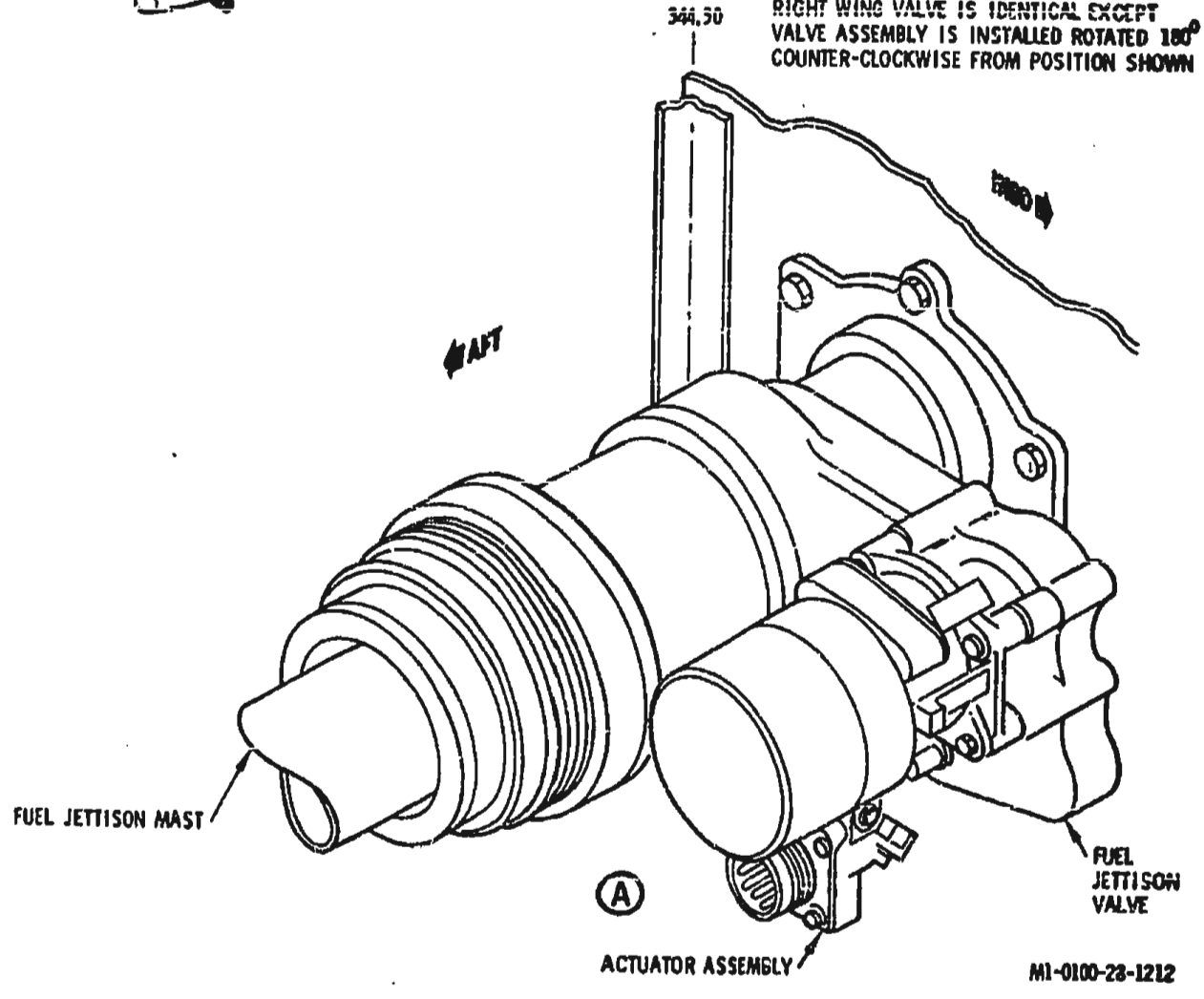
EM1 39200-28-1063

Fuel Jettison System Block Diagram
Figure 3



NOTE

LEFT WING FUEL JETTISON VALVE IS SHOWN.
RIGHT WING VALVE IS IDENTICAL EXCEPT
VALVE ASSEMBLY IS INSTALLED ROTATED 180°
COUNTER-CLOCKWISE FROM POSITION SHOWN



R Fuel Jettison Valve
R Figure 4

signal conditioner is energized, and the defuel valve open circuit from the jettison panel (DUMP) switch to the defuel valve control relay is enabled. At fuel jettison cutoff, the thermistor is uncovered. Its resistance goes low and the signal conditioner responds by de-energizing the internal jettison control relay. This disables the defuel valve control relay circuit; the relay relaxes, and 28V dc close power is applied to the defuel valve actuator.

6. System Operation (Ref. Fig. 5)

A. Fuel Jettison

(1) The following events occur when the FUEL JETTISON MASTER switch is depressed (latched in):

(a) The OPEN legend is illuminated, indicating that the switch is in the jettison select position.

(b) A 28V dc valve open power circuit is completed to both left and right wing fuel jettison valve actuators. Valve opening is indicated by the blue valve in-transit/disagreement lights to either side of the MASTER switch coming on, then going out.

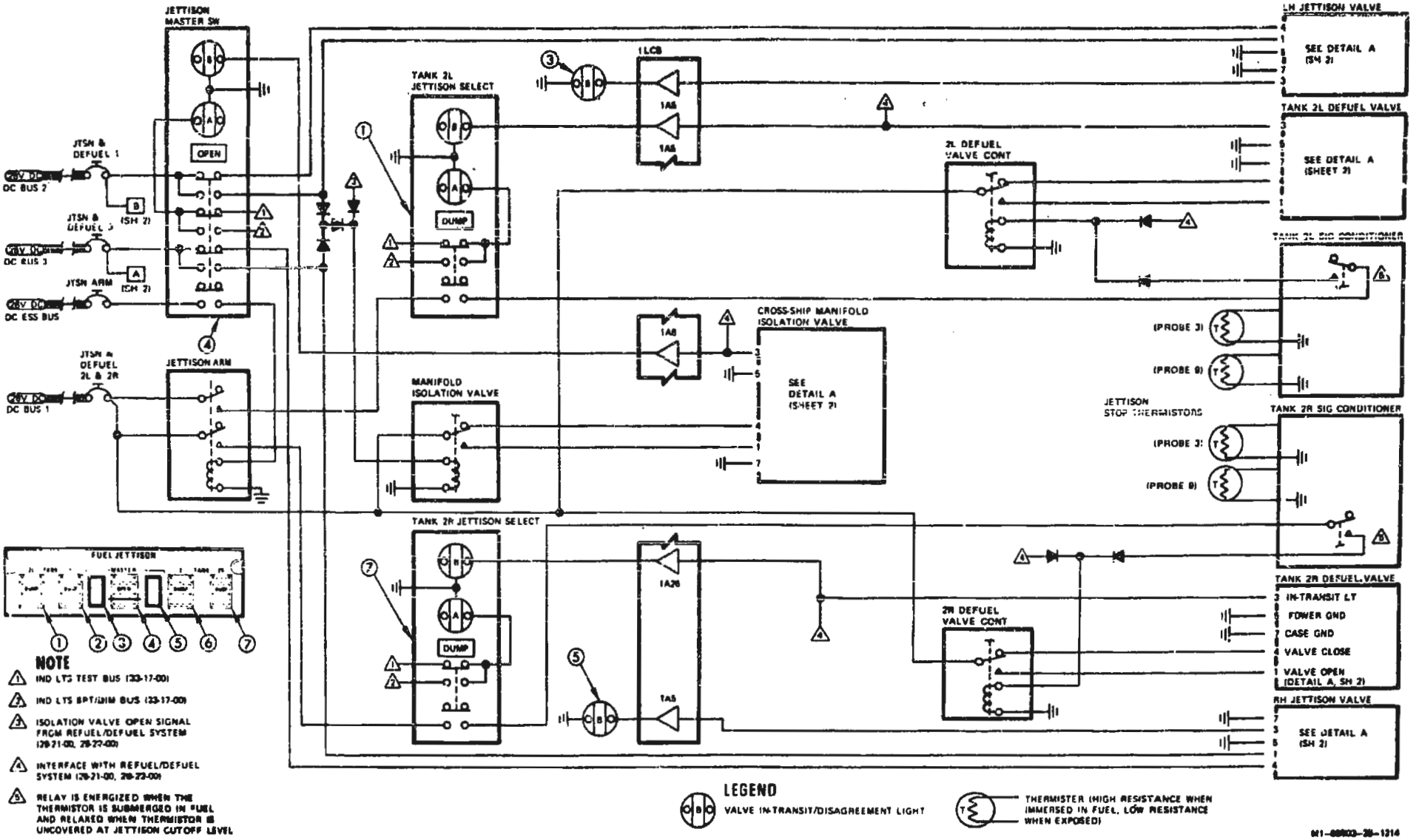
(c) The cross-ship manifold isolation valve control relay is energized. 28V dc valve open power is applied through the energized relay contacts to the isolation valve actuator. Valve opening is indicated by the blue valve in-transit light in the MASTER switch coming on, then going out.

(d) The fuel jettison arm relay is energized and each of the tank 2R, 1, 3, and 2L fuel (DUMP) switches are armed by 28V dc power through the relay contacts.

(e) On aircraft 025-026, 028-999, Jettison arm relay No. 2 is engaged and the tank 1A and 3A gravity transfer valves are opened.

(2) The following events occur when the tank 2L, 1, 3, and 2R defuel (DUMP) valve switches are depressed (latched in):

(a) The DUMP light legends are illuminated, indicating that the switch is latched in the tank defuel valve open position.



R
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Fuel Jettison Schematic
Figure 5 (Sheet 1)

EFFECTIVITY: 001-024, 027

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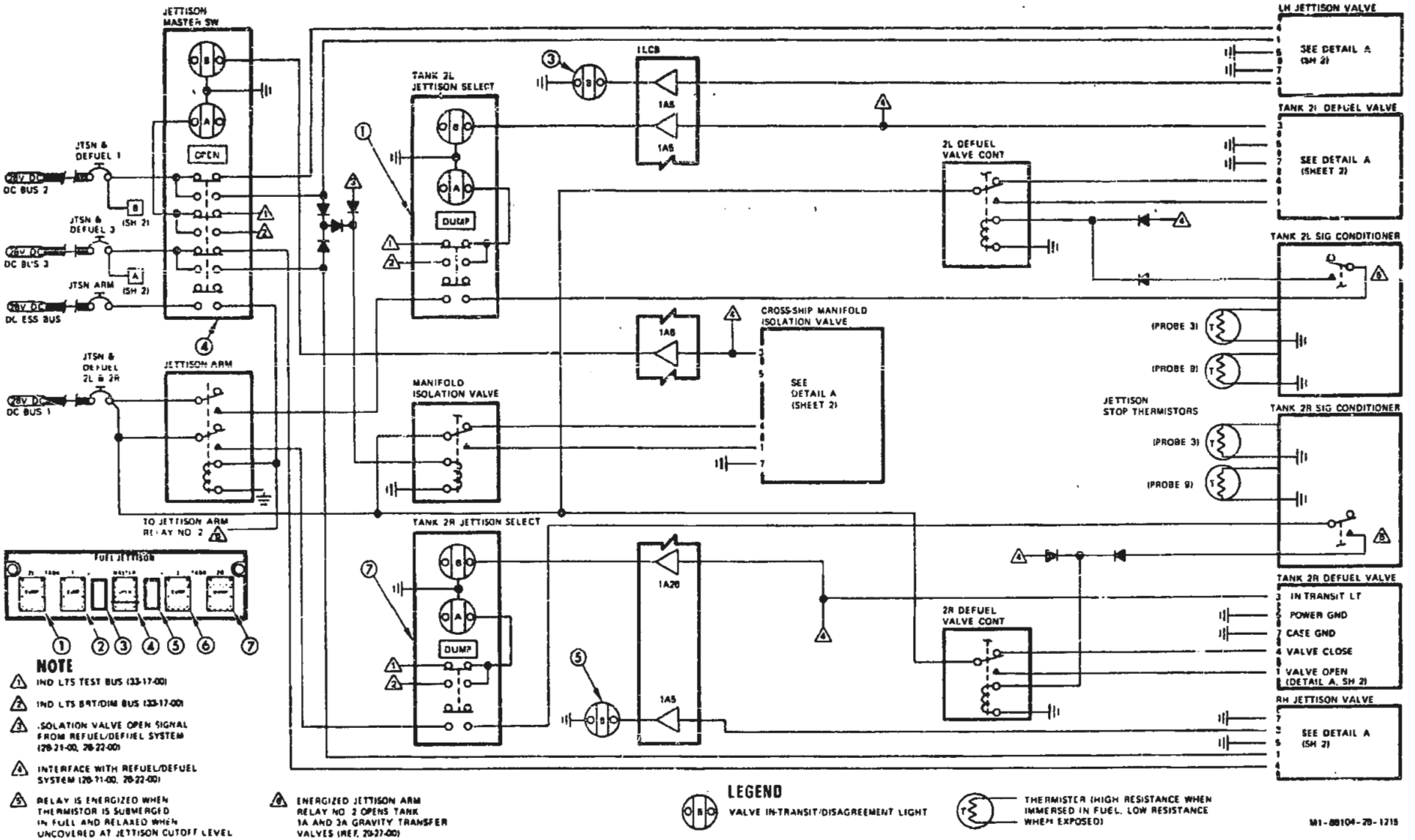
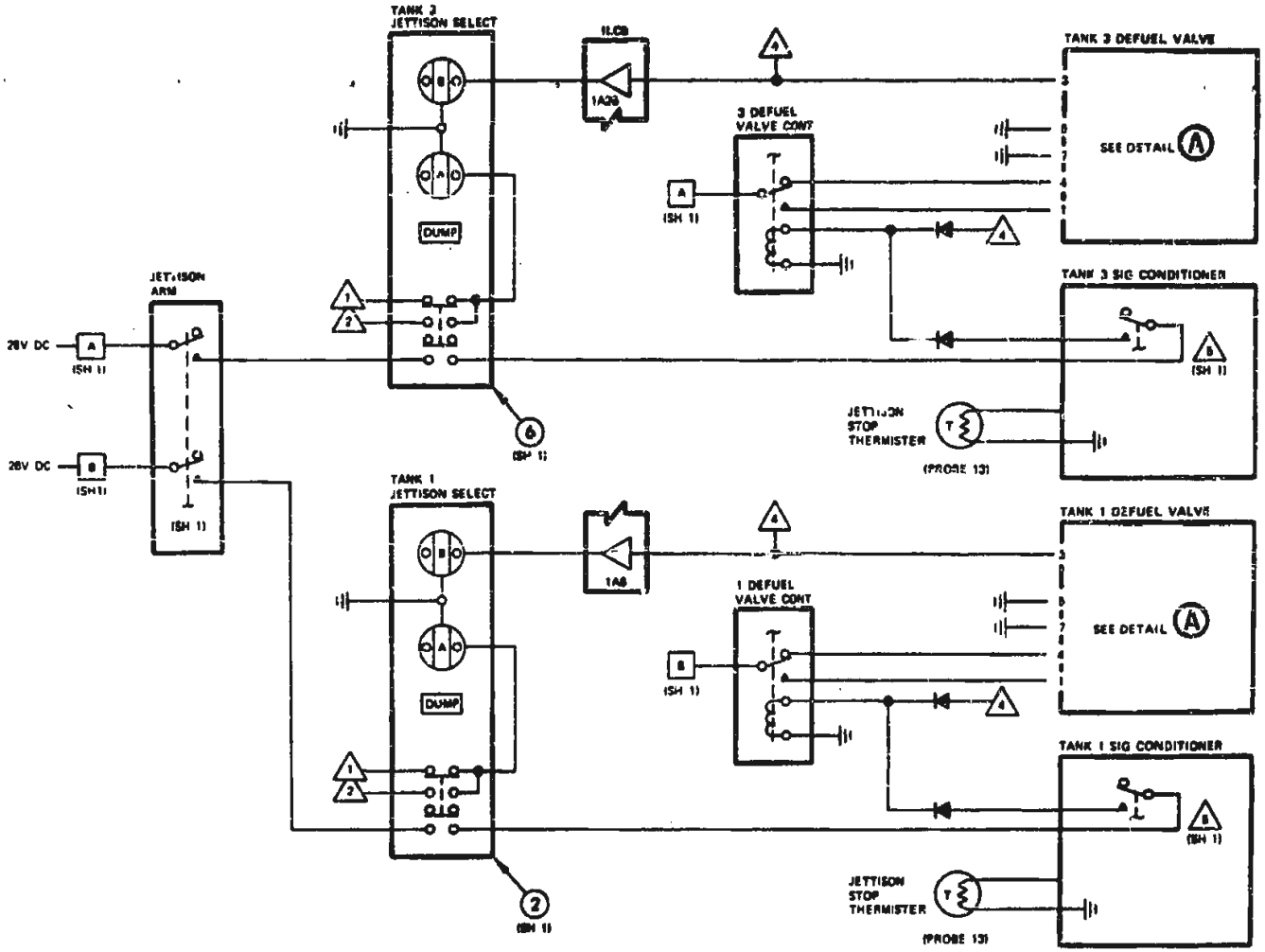
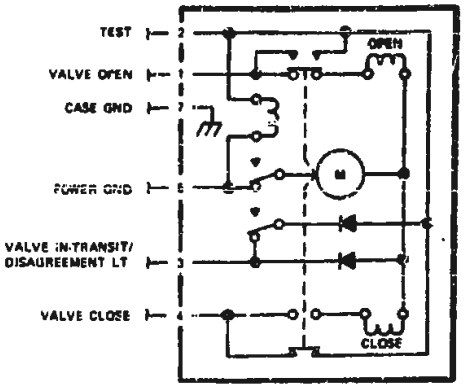


Fuel Jettison Schematic
Figure 5 (Sheet 1)

R R 0018 EFFECTIVITY: 025-026, 028-999





TYPICAL INTERNAL WIRING FOR JETTISON, DEFUEL, AND MANIFOLD ISOLATION VALVE ACTUATORS

M1-0102-28-1248

Fuel Jettison Schematic
Figure 5 (Sheet 2)

R
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001B EFFECTIVITY: ALL

(b) Each of the tank defuel valve control relays is energized by 28V dc applied through the energized jettison stop thermistor controlled relay in the respective tank signal conditioners and 28V dc valve open power is applied to the tank defuel valve actuators. Valve opening is indicated by the blue valve in-transit light in the switch coming on, then going out.

NOTE: Fuel is now being pumped under boost pump pressure into the cross-ship refuel/defuel manifold and jettisoned overboard through the opened right and left wing fuel
R jettison valves.

R (c) Since the tank 2L and 2R boost pumps are located
R in tank inboard section, fuel will be pumped out
R of this section only until the surge box fuel
R level is depleted to approximately 1000 lbs (454
R Kg). Fuel will then begin to transfer from the
R outboard section through the float actuated fuel
R transfer valve (Ref. 28-27-00). The rate of fuel
R transfer, however, is not great enough to maintain
R the surge box at the level necessary to prevent
R boost pump starvation. The probe No. 9 jettison
R stop thermistor, which monitors the surge box fuel
R level, is set to close the defuel valve at the 900
R lb (408 Kg) fuel level and reopen it when
R sufficient fuel is transferred to once again
R immerse the thermister. The thermistor will
R therefore cycle the valve closed and open until
R the fuel level in the outboard section is depleted
R to the auto-cutoff point. A 3-second time delay,
R incorporated in the tank 2L and 2R signal
R conditioner jettison control circuitry, insures
R that the fuel level will rise well above the
R thermistor and reduces the defuel valve closed and
R open cycling rate. At the auto-cutoff point, the
R probe No. 3 thermistor in the outboard section
R will keep the valve closed. Fuel jettison will
R then terminate. Fuel transfer will continue as
R required to maintain the surge box fuel level at
R 1000 lbs (454 Kg). Cycling of the defuel valve
R causes the defuel valve in-transit light to be
R intermittently on and off and is an indication of
R normal system operation.

R (d) Tank 1 and 3 jettisoning is automatically
R terminated when the tank fuel level is lowered to
R the auto-cutoff point and uncovers the probe No.
R 13 jettison stop thermistor. Closing of the tank
R 1 and 3 defuel valves will be indicated by the

R DUMP switch valve in-transit lights coming on,
R then going out.

R (e) Fuel Jettison from either tank may be selectively
R terminated at any time before automatic shutoff by
R unlatching the dump valve switch, or completely
R terminated by releasing (unlatching) the MASTER
R switch.

(3) When the jettison panel MASTER switch is released (unlatched):

(a) The switch open light circuit is broken and the OPEN light goes out.

(b) A 28V dc valve close power circuit is completed to both left and right fuel jettison valve actuators. Valve closing is indicated by the valve in-transit/disagreement light coming on, then going out.

(c) The cross-ship manifold isolation valve control relay is deenergized. 28V dc valve closed power is applied through the de-energized relay contacts to the isolation valve actuator. Valve closing is indicated by the blue light in the MASTER switchlight coming on, then going out.

(d) The fuel jettison arm relay is de-energized.

(e) On aircraft with wing center section tanks, jettison arm relay No. 2 is de-energized and tank 1A and 3A gravity transfer valves are closed (Ref. 28-27-00).

(4) When the tank 2L, 1, 3 and 2R defuel (DUMP) valve switchlights are released (unlatched), the DUMP valve lights go out.

R # FUEL JETTISON SYSTEM - FAULT ISOLATION

R 1. General

R Reference data and fault isolation procedures for troubleshooting fuel jettison system faults are included in this section of the manual. Fuel system malfunction detected by the flight crew is normally entered in the aircraft flight log book and reported to maintenance personnel by a FIRM fault code number. This number and the flight log book write-up can be found in the Chapter 28 Fault Code Index. The index specifies the maintenance manual section, fault isolation diagram figure number and, where appropriate, a block number indicating the diagram entry point containing the fault isolation procedure. When no block number is specified, the diagram entry point is block 1.

R Prerequisites listed at the top of each diagram identify mandatory preliminary steps and circuit breakers that must be closed before initiating any fault isolation step.

R Schematic diagrams, identified by a SCHEM number, supplement fault isolation procedures as maintenance aids. The schematics show the basic system circuitry necessary for troubleshooting and include cross-reference indexes to the wiring diagram manual pages required for checking component interconnect wiring.

R 2. Fault Isolation

R Table 101 is a list of fault isolation data in this section of the manual.

R Fault Isolation Data
R Table 101

R FIGURE NUMBER	TITLE
R 101	Component Locator Index
R 102	Jettison System Component Locator
R 103	Dumping Did Not Stop
R 104	DUMP Blue Disagreement Light Did Not Come On
R 105	DUMP Blue Disagreement Light On Steady

R Fault Isolation Data (Cont)
R Table 101

FIGURE NUMBER	TITLE
106	MASTER Blue Disagreement Light Problems
107	Left and Right Jettison Valve Blue Disagreement Light Problems
108	MASTER OPEN or TANK DUMP Light Problems
109	DUMP Blue Light Did Not Come On When Switchlight Released
SCHEM 1	Fuel Jettison System Schematic

COMPONENT	QTY	AREA/ACCESS	REFERENCE
ACTUATOR			
DEFUEL VALVE, TANK 1/3	2	541AB, 641AB	28-22-05
DEFUEL VALVE, TANK 2L/2R	2	541GB, 641GB	28-22-02
JETTISON VALVE	2	571BB, 671BB	28-31-02
MANIFOLD ISOLATION VALVE	1	147AB	28-21-04
ASSEMBLY, DEFUEL VALVE PLUG-IN, 2L/2R	2	541GB, 641GB	28-22-02
RELAY			
DEFUEL VALVE, TANK 2L (2831-K4)	1	MESC, 192K	20-24-01
DEFUEL VALVE, TANK 2R (2831-K2)	1	MESC, 192K	20-24-01
DEFUEL VALVE, TANK 1 (2831-K3)	1	MESC, 192K	20-24-01
DEFUEL VALVE, TANK 3 (2831-K1)	1	MESC, 192K	20-24-01
FUEL JETTISON ARM (2831-K6)	1	FE/SO RELAY PNL	*
MANIFOLD ISOLATION (2831-K5)	1	MESC, 192K	28-31-03
SIGNAL CONDITIONER, TANK 1/3	2	MESC, 192K	28-41-30
SWITCH			
LIGHT, DUMP	4	FE/SO PNL	20-33-01
LIGHT, MASTER (2831-S53)	1	FE/SO PNL	20-33-01
VALVE			
MANIFOLD ISOLATION	1	HSC, FWD WALL, 147AB	28-21-03
JETTISON	2	571BB, 671BB	28-31-02

*SEE WM EQUIPMENT LIST

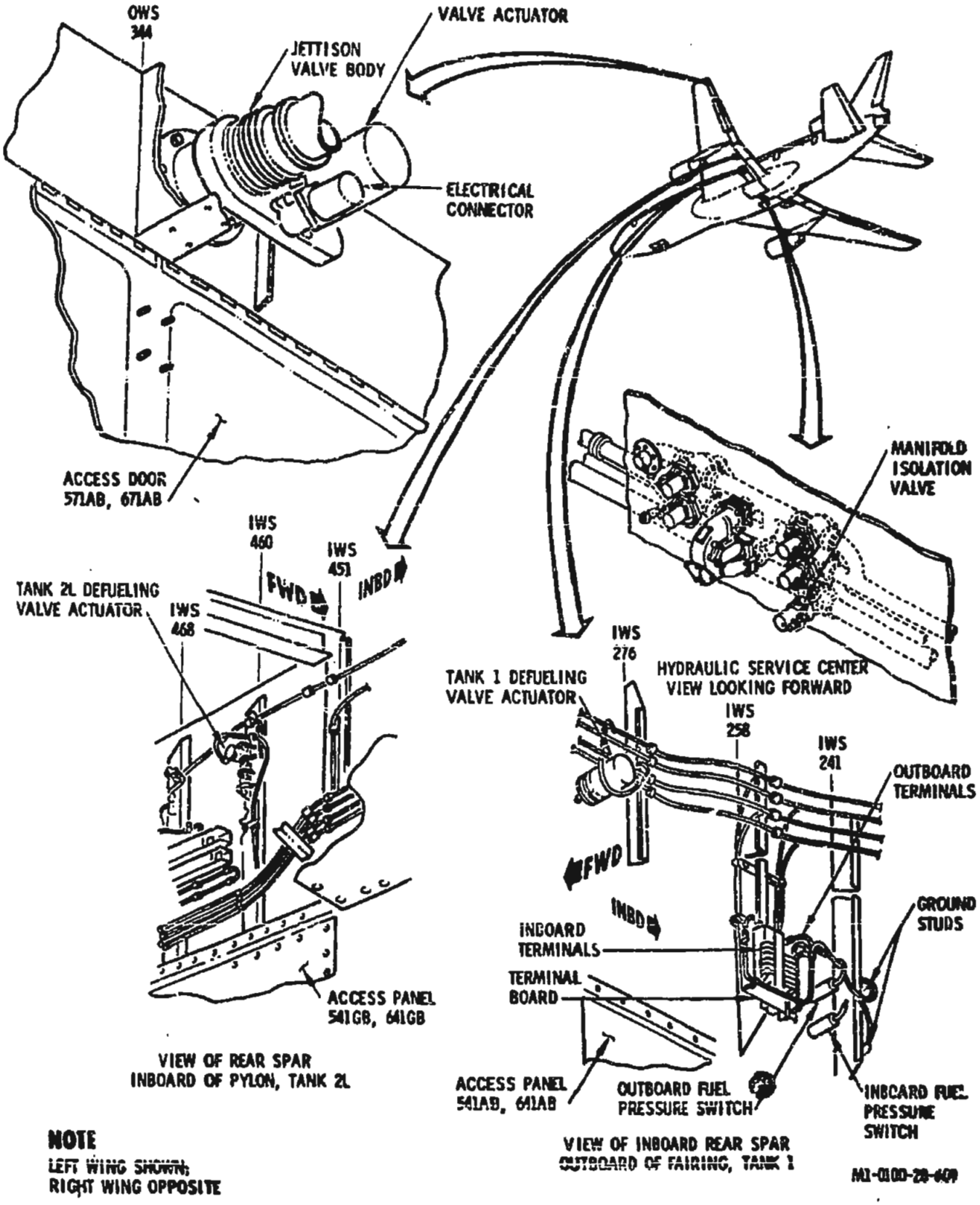
M1-0001-28-000

R
R

Component Locator Index
Figure 101

EFFECTIVITY: ALL

001B



NOTE

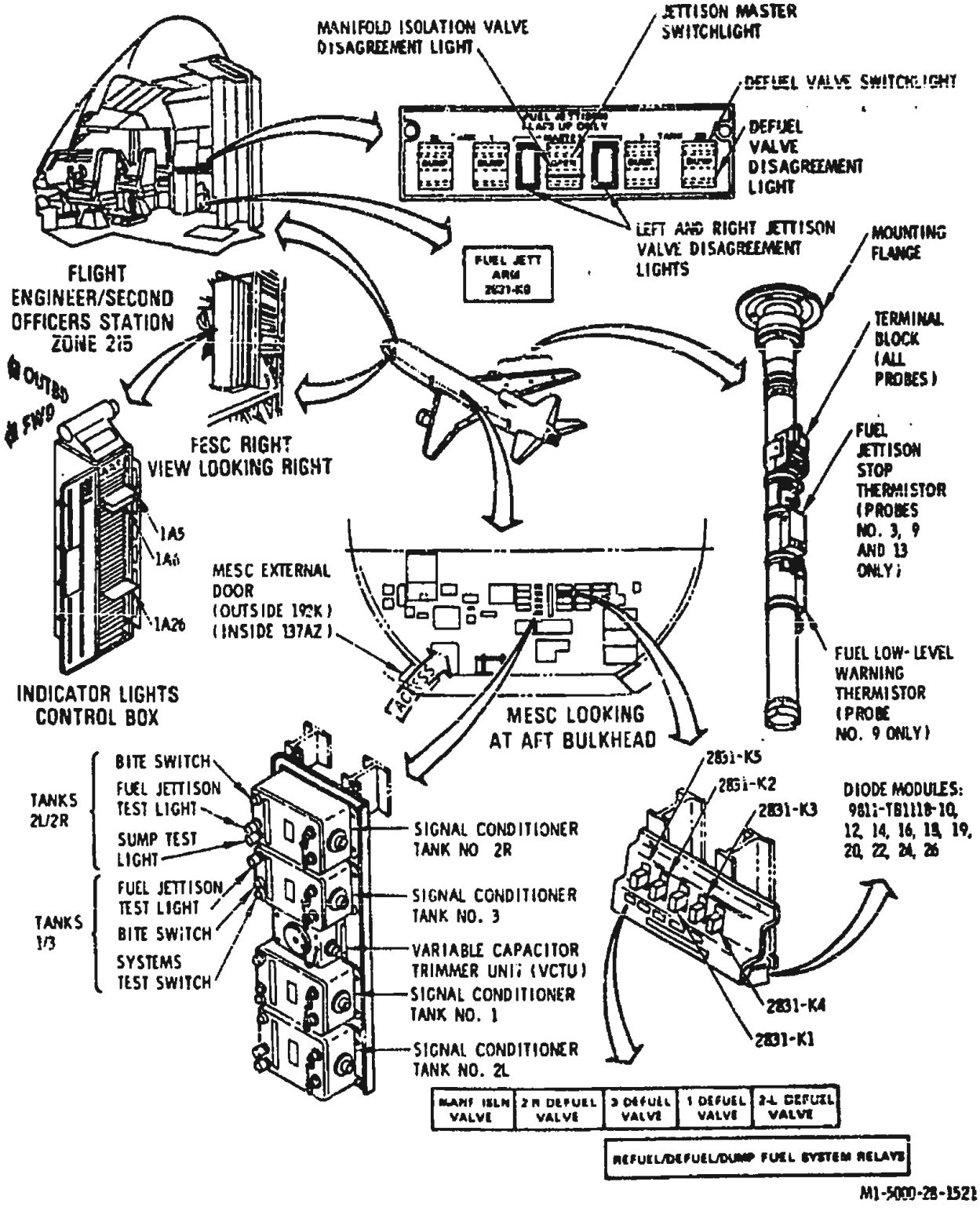
LEFT WING SHOWN;
RIGHT WING OPPOSITE

R
R

Jettison System Component Locator
Figure 102 (Sheet 1)

EFFECTIVITY: ALL

001B

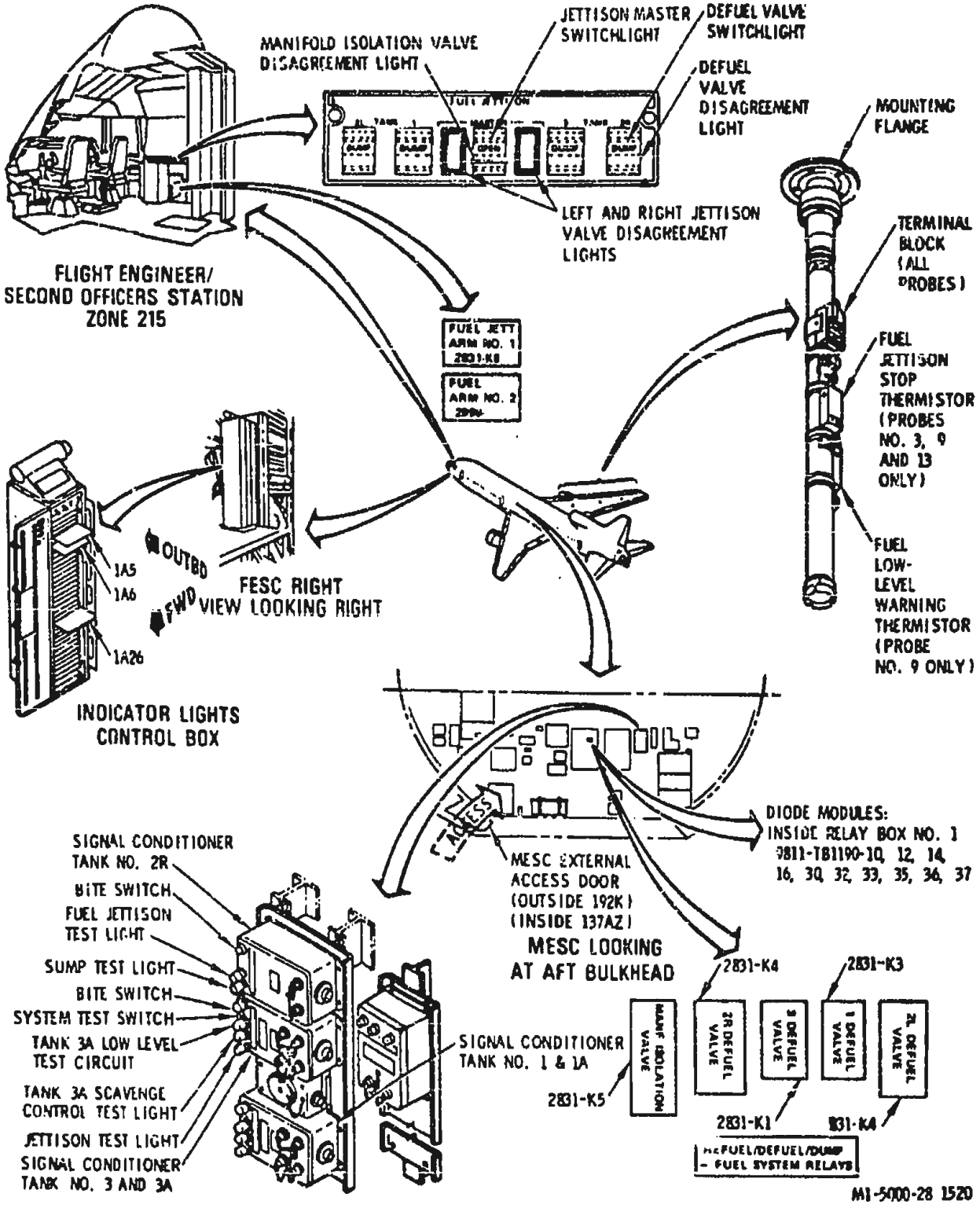


CR
CR

Jettison System Component Locator
Figure 102 (Sheet 2)

EFFECTIVITY: 001-023

001B

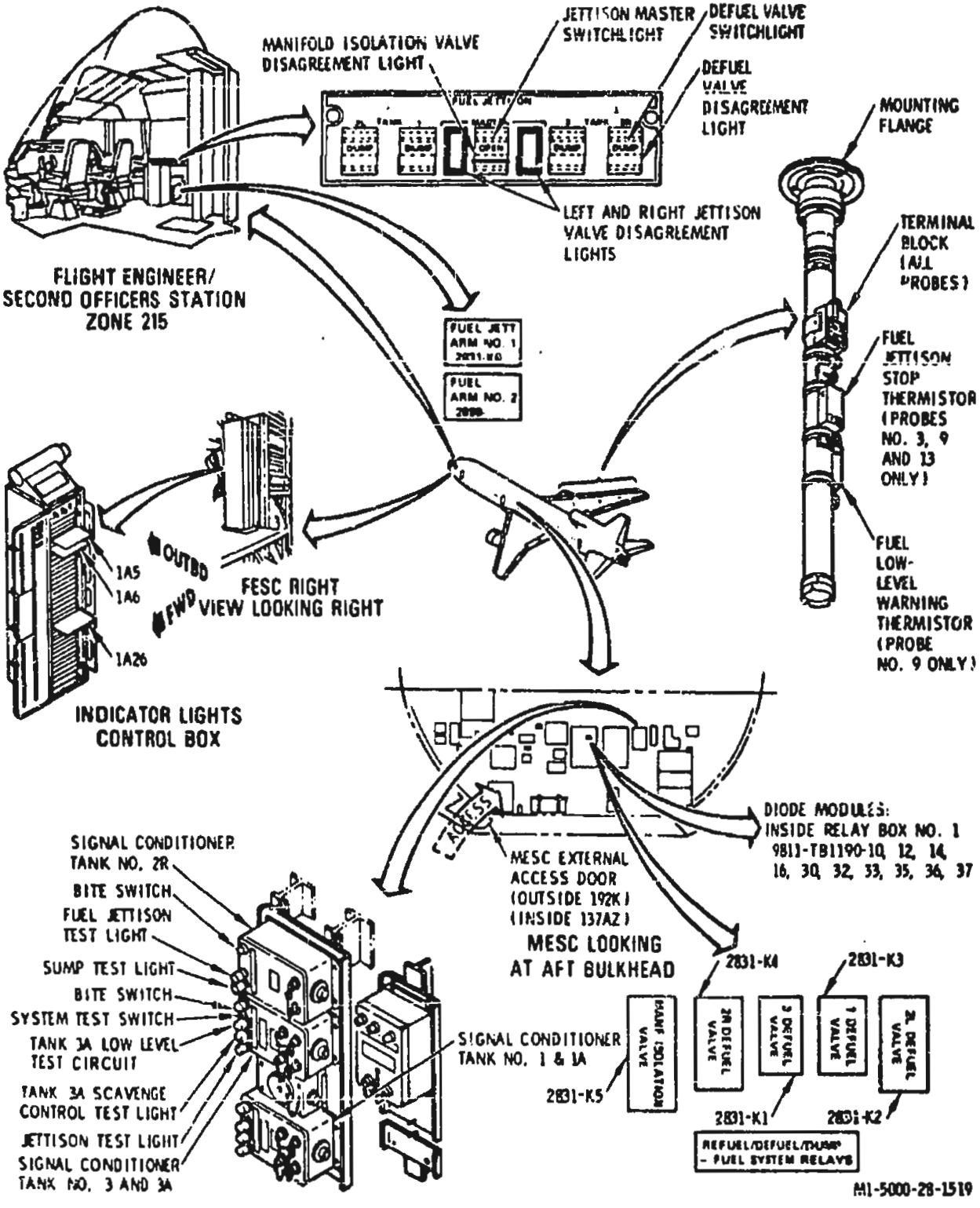

MANIFOLD ISOLATION VALVE DISAGREEMENT LIGHT
JETTISON MASTER SWITCHLIGHT
DEFUEL VALVE SWITCHLIGHT
DEFUEL VALVE DISAGREEMENT LIGHT
LEFT AND RIGHT JETTISON VALVE DISAGREEMENT LIGHTS
FLIGHT ENGINEER/ SECOND OFFICERS STATION ZONE 215
MOUNTING FLANGE
TERMINAL BLOCK (ALL PROBES)
FUEL JETTISON STOP THERMISTOR (PROBES NO. 3, 9 AND 13 ONLY)
FUEL LOW-LEVEL WARNING THERMISTOR (PROBE NO. 9 ONLY)
FUEL JETT ARM NO. 1
FUEL ARM NO. 2
OUTBD
FWD
1A5
1A6
1A26
FESC RIGHT VIEW LOOKING RIGHT
INDICATOR LIGHTS CONTROL BOX
ACCESS
DIODE MODULES: INSIDE RELAY BOX NO. 1 9811-TB1190-10, 12, 14, 16, 30, 32, 33, 35, 36, 37
MESC EXTERNAL ACCESS DOOR (OUTSIDE 192K) (INSIDE 137AZ)
MESC LOOKING AT AFT BULKHEAD
SIGNAL CONDITIONER TANK NO. 2R
BITE SWITCH
FUEL JETTISON TEST LIGHT
SUMP TEST LIGHT
BITE SWITCH
SYSTEM TEST SWITCH
TANK 3A LOW LEVEL TEST CIRCUIT
TANK 3A SCAVENGE CONTROL TEST LIGHT
JETTISON TEST LIGHT
SIGNAL CONDITIONER TANK NO. 3 AND 3A
SIGNAL CONDITIONER TANK NO. 1 & 1A
2831-K4
2831-K3
2831-K5
2831-K1
2831-K4
MANF ISOLATION VALVE
2R DEFUEL VALVE
3 DEFUEL VALVE
1 DEFUEL VALVE
2L DEFUEL VALVE
- FUEL SYSTEM RELAYS
M1-5000-28 1520

CR
CR

Jettison System Component Locator
Figure 102 (Sheet 2)

EFFECTIVITY: 024, 027

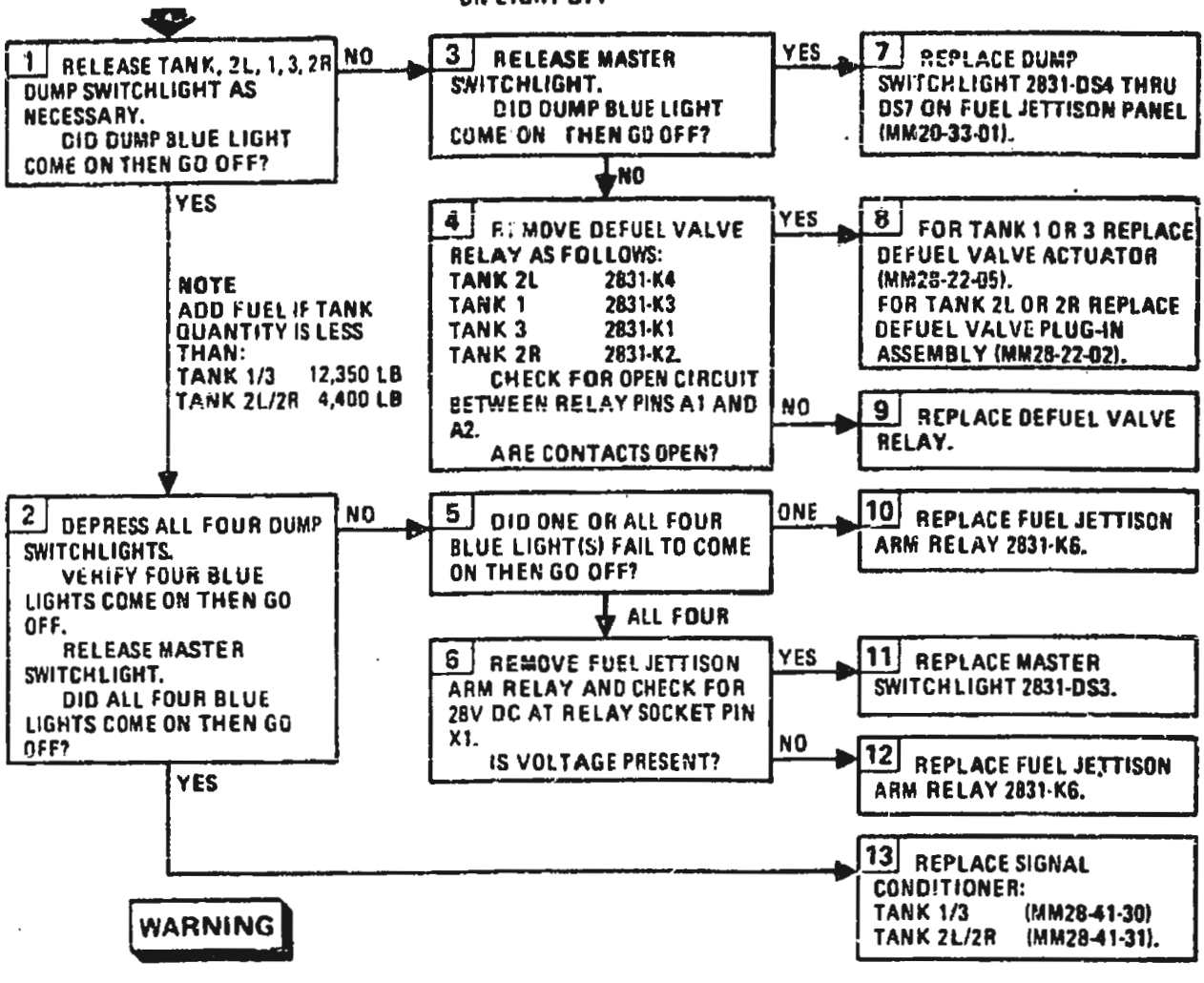
001B


MANIFOLD ISOLATION VALVE DISAGREEMENT LIGHT
JETTISON MASTER SWITCHLIGHT
DEFUEL VALVE SWITCHLIGHT
DEFUEL VALVE DISAGREEMENT LIGHT
LEFT AND RIGHT JETTISON VALVE DISAGREEMENT LIGHTS
FLIGHT ENGINEER/ SECOND OFFICERS STATION ZONE 215
MOUNTING FLANGE
TERMINAL BLOCK (ALL PROBES)
FUEL JETTISON STOP THERMISTOR (PROBES NO. 3, 9 AND 13 ONLY)
FUEL LOW-LEVEL WARNING THERMISTOR (PROBE NO. 9 ONLY)
FUEL JETT ARM NO. 1
FUEL ARM NO. 2
OUTBD
FWD
1A5
1A6
1A26
FESC RIGHT VIEW LOOKING RIGHT
INDICATOR LIGHTS CONTROL BOX
ACCESS
MESC EXTERNAL ACCESS DOOR (OUTSIDE 192K) (INSIDE 137AZ)
MESC LOOKING AT AFT BULKHEAD
DIODE MODULES: INSIDE RELAY BOX NO. 1 9811-TB1190-10, 12, 14, 16, 30, 32, 33, 35, 36, 37
SIGNAL CONDITIONER TANK NO. 2R
BITE SWITCH
FUEL JETTISON TEST LIGHT
SUMP TEST LIGHT
BITE SWITCH
SYSTEM TEST SWITCH
TANK 3A LOW LEVEL TEST CIRCUIT
TANK 3A SCAVENGE CONTROL TEST LIGHT
JETTISON TEST LIGHT
SIGNAL CONDITIONER TANK NO. 3 AND 3A
SIGNAL CONDITIONER TANK NO. 1 & 1A
2831-K4
2831-K3
2831-K5
2831-K1
2831-K2
MANF ISOLATION VALVE
2R DEFUEL VALVE
3 DEFUEL VALVE
1 DEFUEL VALVE
2L DEFUEL VALVE
REFUEL/DEFUEL/DUMP - FUEL SYSTEM RELAYS
M1-5000-28-1519

C C Jettison System Component Locator
Figure 102 (Sheet 2)

R R 0018 EFFECTIVITY: 025-026, 028-999

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: CB3-T1 THRU T5, U3, U11, U12, U18
ON FUEL JETTISON PANEL: MASTER SWITCHLIGHT DEPRESSED, OPEN ON, MASTER AND TWO JETTISON BLUE DISAGREEMENT LIGHTS ON THEN OFF. TANK 2L, 1, 3, OR 2R SWITCHLIGHTS DEPRESSED, DUMP ON, AS NECESSARY
ON FUEL SYSTEM PANEL: REFUEL POWER SWITCHLIGHT PRESSED, ON LIGHT OFF

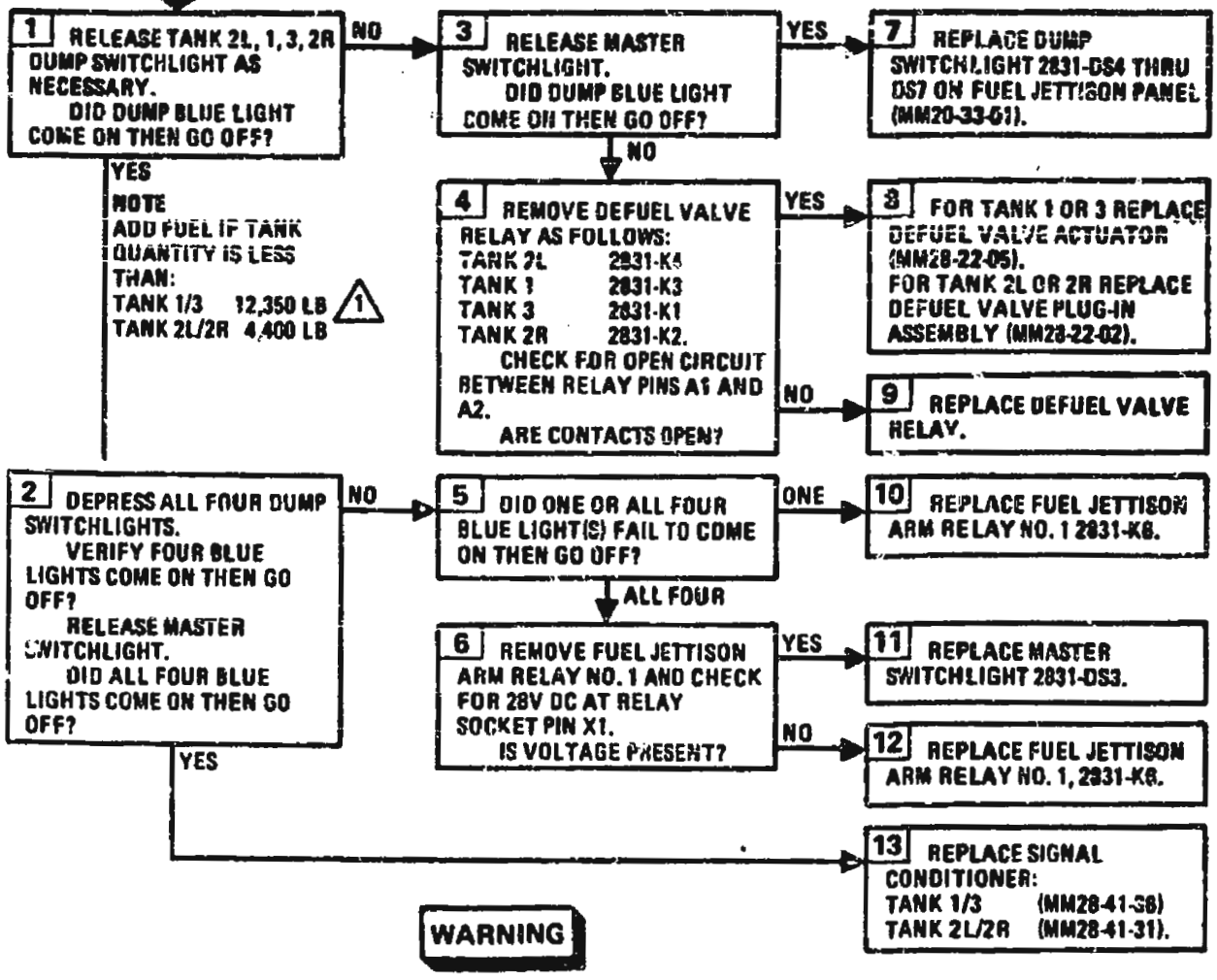

DUMPING DID NOT STOP
1 RELEASE TANK, 2L, 1, 3, 2R DUMP SWITCHLIGHT AS NECESSARY. DID DUMP BLUE LIGHT COME ON THEN GO OFF?
NO
3 RELEASE MASTER SWITCHLIGHT. DID DUMP BLUE LIGHT COME ON THEN GO OFF?
YES
7 REPLACE DUMP SWITCHLIGHT 2831-DS4 THRU DS7 ON FUEL JETTISON PANEL (MM20-33-01).
NO
YES
NOTE
ADD FUEL IF TANK QUANTITY IS LESS THAN:
TANK 1/3 12,350 LB
TANK 2L/2R 4,400 LB
4 REMOVE DEFUEL VALVE RELAY AS FOLLOWS:
TANK 2L 2831-K4
TANK 1 2831-K3
TANK 3 2831-K1
TANK 2R 2831-K2.
CHECK FOR OPEN CIRCUIT BETWEEN RELAY PINS A1 AND A2.
ARE CONTACTS OPEN?
YES
8 FOR TANK 1 OR 3 REPLACE DEFUEL VALVE ACTUATOR (MM28-22-05).
FOR TANK 2L OR 2R REPLACE DEFUEL VALVE PLUG-IN ASSEMBLY (MM28-22-02).
NO
9 REPLACE DEFUEL VALVE RELAY.
2 DEPRESS ALL FOUR DUMP SWITCHLIGHTS. VERIFY FOUR BLUE LIGHTS COME ON THEN GO OFF. RELEASE MASTER SWITCHLIGHT. DID ALL FOUR BLUE LIGHTS COME ON THEN GO OFF?
NO
5 DID ONE OR ALL FOUR BLUE LIGHT(S) FAIL TO COME ON THEN GO OFF?
ONE
10 REPLACE FUEL JETTISON ARM RELAY 2831-K6.
ALL FOUR
6 REMOVE FUEL JETTISON ARM RELAY AND CHECK FOR 28V DC AT RELAY SOCKET PIN X1. IS VOLTAGE PRESENT?
YES
11 REPLACE MASTER SWITCHLIGHT 2831-DS3.
NO
12 REPLACE FUEL JETTISON ARM RELAY 2831-K6.
YES
13 REPLACE SIGNAL CONDITIONER:
TANK 1/3 (MM28-41-30)
TANK 2L/2R (MM28-41-31).
WARNING

OBSERVE ALL FUEL SYSTEM PRECAUTIONS.
PLACE AN EMPTY CATCH BASIN UNDER JETTISON NOZZLES TO CATCH DRAINING FUEL
OPEM AN TAG: CB3-U5 THRU U10, U13, U14

M1-0002-28-513

R Dumping Did Not Stop
R Figure 103

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: CB3-T1 THRU T5, U2, U11, U12, U18
ON FUEL JETTISON PANEL, MASTER SWITCHLIGHT DEPRESSED, OPEN ON, MASTER AND TWO JETTISON BLUE DISAGREEMENT LIGHTS ON THEN OFF. TANK 2L, 1, 3, OR 2R SWITCHLIGHTS DEPRESSED, DUMP ON, AS NECESSARY
ON FUEL SYSTEM PANEL: 1A AND 3A XFR, AND TANK 1A AND 3A GRAVITY TRANSFER SWITCHLIGHTS RELEASED, XFR LIGHTS OFF
REFUEL POWER SWITCHLIGHT PRESSED, ON LIGHT OFF


DUMPING DID NOT STOP
1 RELEASE TANK 2L, 1, 3, 2R DUMP SWITCHLIGHT AS NECESSARY.
DID DUMP BLUE LIGHT COME ON THEN GO OFF?
NO
YES
NOTE
ADD FUEL IF TANK QUANTITY IS LESS THAN:
TANK 1/3 12,350 LB
TANK 2L/2R 4,400 LB
1
3 RELEASE MASTER SWITCHLIGHT.
DID DUMP BLUE LIGHT COME ON THEN GO OFF?
YES
7 REPLACE DUMP SWITCHLIGHT 2831-DS4 THRU DS7 ON FUEL JETTISON PANEL (MM20-33-61).
NO
4 REMOVE DEFUEL VALVE RELAY AS FOLLOWS:
TANK 2L 2831-K4
TANK 1 2831-K3
TANK 3 2831-K1
TANK 2R 2831-K2.
CHECK FOR OPEN CIRCUIT BETWEEN RELAY PINS A1 AND A2.
ARE CONTACTS OPEN?
YES
8 FOR TANK 1 OR 3 REPLACE DEFUEL VALVE ACTUATOR (MM28-22-05).
FOR TANK 2L OR 2R REPLACE DEFUEL VALVE PLUG-IN ASSEMBLY (MM28-22-02).
NO
9 REPLACE DEFUEL VALVE RELAY.
2 DEPRESS ALL FOUR DUMP SWITCHLIGHTS.
VERIFY FOUR BLUE LIGHTS COME ON THEN GO OFF?
RELEASE MASTER SWITCHLIGHT.
DID ALL FOUR BLUE LIGHTS COME ON THEN GO OFF?
NO
5 DID ONE OR ALL FOUR BLUE LIGHT(S) FAIL TO COME ON THEN GO OFF?
ONE
10 REPLACE FUEL JETTISON ARM RELAY NO. 1 2831-K6.
ALL FOUR
6 REMOVE FUEL JETTISON ARM RELAY NO. 1 AND CHECK FOR 28V DC AT RELAY SOCKET PIN X1.
IS VOLTAGE PRESENT?
YES
11 REPLACE MASTER SWITCHLIGHT 2831-DS3.
NO
12 REPLACE FUEL JETTISON ARM RELAY NO. 1, 2831-K6.
YES
13 REPLACE SIGNAL CONDITIONER:
TANK 1/3 (MM28-41-36)
TANK 2L/2R (MM28-41-31).

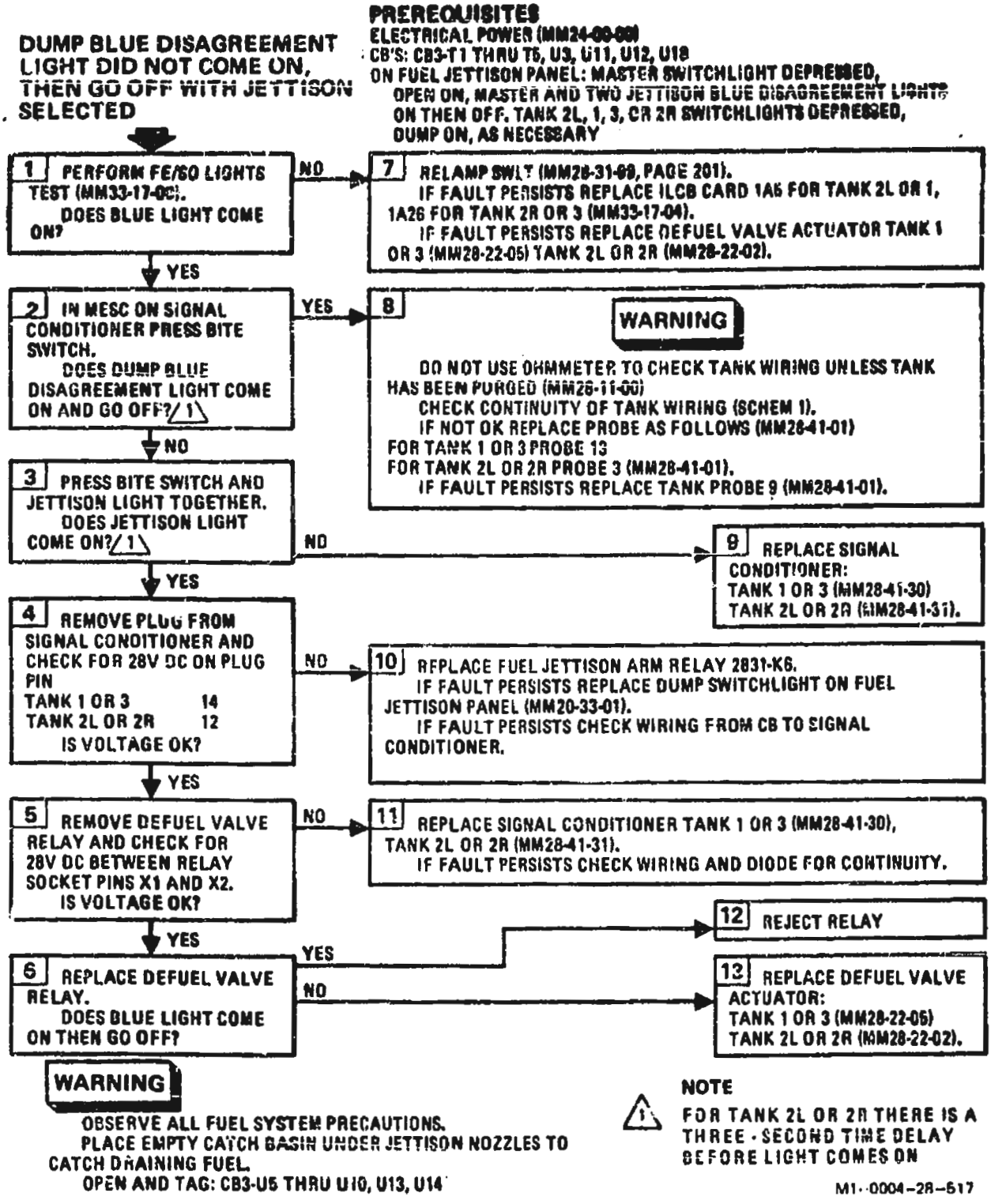
WARNING

OBSERVE ALL FUEL SYSTEM PRECAUTIONS.
PLACE AN EMPTY CATCH BASIN UNDER JETTISON NOZZLES TO CATCH DRAINING FUEL
OPEN AND TAG: CB3-U3, U4, U7 THRU U10, U13, U14.

1 NOTE
FUEL QUANTITY IS WING TANKS ONLY

M1-28002-28-1107

Dumping Did Not Stop
Figure 103


DUMP BLUE DISAGREEMENT LIGHT DID NOT COME ON, THEN GO OFF WITH JETTISON SELECTED
PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: CB3-T1 THRU T5, U3, U11, U12, U18
ON FUEL JETTISON PANEL: MASTER SWITCHLIGHT DEPRESSED, OPEN ON, MASTER AND TWO JETTISON BLUE DISAGREEMENT LIGHTS ON THEN OFF. TANK 2L, 1, 3, OR 2R SWITCHLIGHTS DEPRESSED, DUMP ON, AS NECESSARY
1 PERFORM FE/GO LIGHTS TEST (MM33-17-00). DOES BLUE LIGHT COME ON?
NO
7 RELAMP SWLT (MM28-31-00, PAGE 201). IF FAULT PERSISTS REPLACE ILCB CARD 1A5 FOR TANK 2L OR 1, 1A26 FOR TANK 2R OR 3 (MM33-17-04). IF FAULT PERSISTS REPLACE DEFUEL VALVE ACTUATOR TANK 1 OR 3 (MM28-22-05) TANK 2L OR 2R (MM28-22-02).
YES
2 IN MESC ON SIGNAL CONDITIONER PRESS BITE SWITCH. DOES DUMP BLUE DISAGREEMENT LIGHT COME ON AND GO OFF? /1\
YES
8 WARNING
DO NOT USE OHMMETER TO CHECK TANK WIRING UNLESS TANK HAS BEEN PURGED (MM28-11-00)
CHECK CONTINUITY OF TANK WIRING (SCHEM 1).
IF NOT OK REPLACE PROBE AS FOLLOWS (MM28-41-01)
FOR TANK 1 OR 3 PROBE 13
FOR TANK 2L OR 2R PROBE 3 (MM28-41-01).
IF FAULT PERSISTS REPLACE TANK PROBE 9 (MM28-41-01).
NO
3 PRESS BITE SWITCH AND JETTISON LIGHT TOGETHER. DOES JETTISON LIGHT COME ON? /1\
NO
9 REPLACE SIGNAL CONDITIONER: TANK 1 OR 3 (MM28-41-30) TANK 2L OR 2R (MM28-41-31).
YES
4 REMOVE PLUG FROM SIGNAL CONDITIONER AND CHECK FOR 28V DC ON PLUG PIN
TANK 1 OR 3 14
TANK 2L OR 2R 12
IS VOLTAGE OK?
NO
10 REPLACE FUEL JETTISON ARM RELAY 2831-K6. IF FAULT PERSISTS REPLACE DUMP SWITCHLIGHT ON FUEL JETTISON PANEL (MM20-33-01). IF FAULT PERSISTS CHECK WIRING FROM CB TO SIGNAL CONDITIONER.
YES
5 REMOVE DEFUEL VALVE RELAY AND CHECK FOR 28V DC BETWEEN RELAY SOCKET PINS X1 AND X2. IS VOLTAGE OK?
NO
11 REPLACE SIGNAL CONDITIONER TANK 1 OR 3 (MM28-41-30), TANK 2L OR 2R (MM28-41-31). IF FAULT PERSISTS CHECK WIRING AND DIODE FOR CONTINUITY.
YES
6 REPLACE DEFUEL VALVE RELAY. DOES BLUE LIGHT COME ON THEN GO OFF?
YES
12 REJECT RELAY
NO
13 REPLACE DEFUEL VALVE ACTUATOR: TANK 1 OR 3 (MM28-22-05) TANK 2L OR 2R (MM28-22-02).
WARNING
OBSERVE ALL FUEL SYSTEM PRECAUTIONS.
PLACE EMPTY CATCH BASIN UNDER JETTISON NOZZLES TO CATCH DRAINING FUEL.
OPEN AND TAG: CB3-U5 THRU U10, U13, U14
/1\ NOTE
FOR TANK 2L OR 2R THERE IS A THREE-SECOND TIME DELAY BEFORE LIGHT COMES ON
M1-0004-28-517

R DUMP Blue Disagreement Light Did Not Come On
R Then Go Off With Jettison Selected
R Figure 104

DUMP BLUE DISAGREEMENT LIGHT DID NOT COME ON, THEN GO OFF WITH JETTISON SELECTED

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: CB3-T1 THRU T5, U2, U11, U12, U16
ON FUEL JETTISON PANEL: MASTER SWITCHLIGHT DEPRESSED, OPEN ON, MASTER AND TWO JETTISON BLUE DISAGREEMENT LIGHTS ON THEN OFF. TANK 2L, 1, 3, OR 2R SWITCHLIGHTS DEPRESSED. DUMP ON, AS NECESSARY.

1 PERFORM FE/SO LIGHTS TEST (MM33-17-00).
DOES BLUE LIGHT COME ON?
- NO → 7 RELAMP SWIT (MM28-31-00, PAGE 201).
IF FAULT PERSISTS REPLACE ILCB CARD 1A5 FOR TANK 2L OR 1, 1A28 FOR TANK 2R OR 3 (MM33-17-04).
IF FAULT PERSISTS REPLACE DEFUEL VALVE ACTUATOR TANK 1 OR 3 (28-22-05) TANK 2L OR 2R (28-22-02)
- YES ↓

2 IN MESC ON SIGNAL CONDITIONER PRESS BITE SWITCH.
DOES DUMP BLUE DISAGREEMENT LIGHT COME ON AND GO OFF? (1)
- YES → 8 WARNING
DO NOT USE OHMMETER TO CHECK TANK WIRING UNLESS TANK HAS BEEN PURGED (MM28-11-00).
CHECK CONTINUITY OF TANK WIRING (SCHEM 1).
IF NOT OK REPLACE PROBE AS FOLLOWS (MM28-41-01):
FOR TANK 1 OR 3 PROBE 13
FOR TANK 2L OR 2R PROBE 3.
IF FAULT PERSISTS REPLACE TANK PROBE 8 (MM28-41-01).
- NO ↓

3 PRESS BITE SWITCH AND JETTISON LIGHT TOGETHER.
DOES JETTISON LIGHT COME ON? (1)
- NO → 9 REPLACE SIGNAL CONDITIONER:
TANK 1 OR 3 (MM28-41-38)
TANK 2L OR 2R (MM28-41-31).
- YES ↓

4 REMOVE PLUG FROM SIGNAL CONDITIONER AND CHECK FOR 28V DC ON PLUG PIN
TANK 1 OR 3 37
TANK 2L OR 2R 12
IS VOLTAGE OK?
- NO → 10 REPLACE FUEL JETTISON ARM RELAY NO. 1 2831-K6.
IF FAULT PERSISTS REPLACE DUMP SWITCHLIGHT ON FUEL JETTISON PANEL (MM20-33-01).
IF FAULT PERSISTS CHECK WIRING FROM CB TO SIGNAL CONDITIONER.
- YES ↓

5 REMOVE DEFUEL VALVE RELAY AND CHECK FOR 28V DC BETWEEN RELAY SOCKET PINS X1 AND X2.
IS VOLTAGE OK?
- NO → 11 REPLACE SIGNAL CONDITIONER TANK 1 OR 3 (MM28-41-38)
TANK 2L OR 2R (MM28-41-31).
IF FAULT PERSISTS CHECK WIRING AND DIODE FOR CONTINUITY.
- YES ↓

6 REPLACE DEFUEL VALVE REALY.
DOES BLUE LIGHT COME ON THEN GO OFF?
- YES → 12 REJECT RELAY
- NO → 13 REPLACE DEFUEL VALVE ACTUATOR:
TANK 1 OR 3 (MM28-22-05).
TANK 2L OR 2R (MM28-22-02).

WARNING

OBSERVE ALL FUEL SYSTEM PRECAUTIONS.
PLACE AN EMPTY CATCH BASIN UNDER JETTISON NOZZLES TO CATCH DRAINING FUEL.
OPEN AND TAG: CB3-U2, U4, U7 THRU U10, U13, U14.

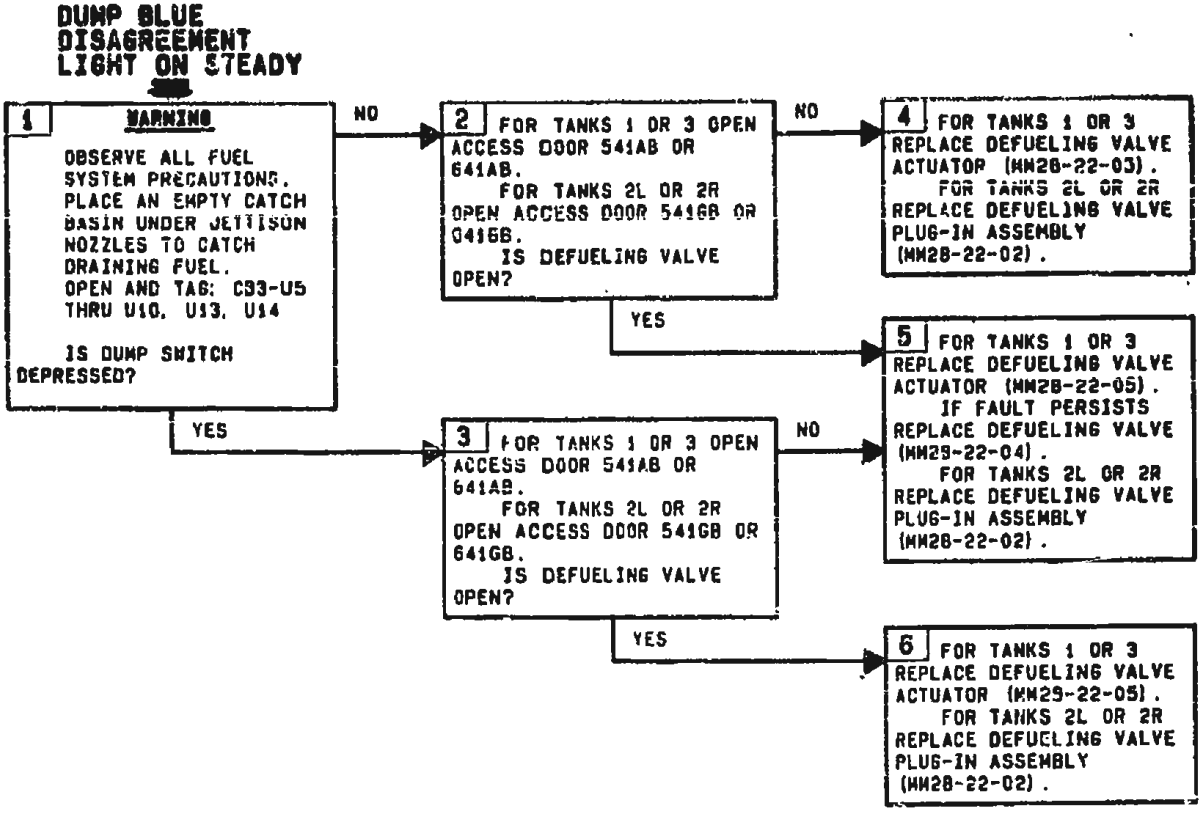
NOTE

(1) THERE IS A THREE-SECOND TIME DELAY BEFORE LIGHTS COME ON.

M1-0004-28-1108

R DUMP Disagreement Light Did Not Come On
R Then Go Off With Jettison Selected
R Figure 104

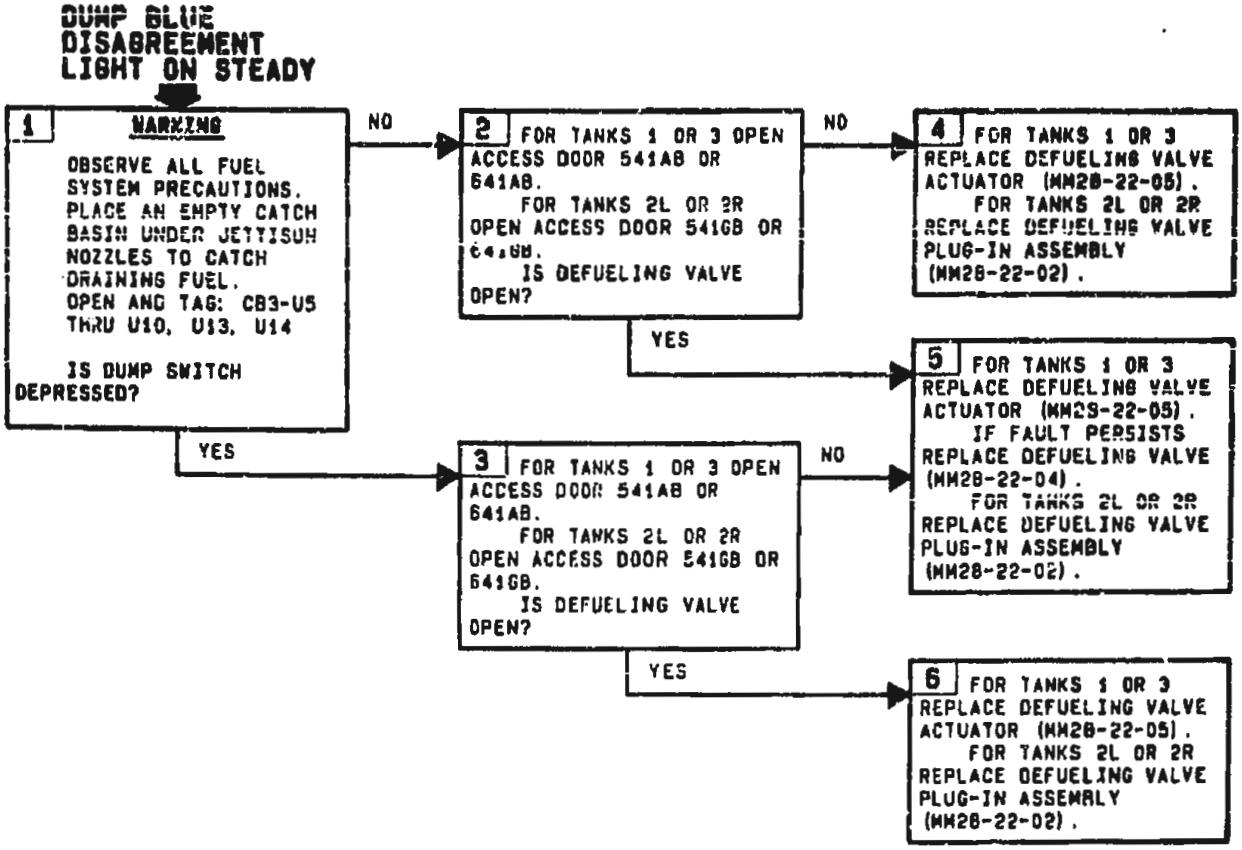
PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: CB3-T1 THRU T6, U3, U11, U12, U16
ON FUEL JETTISON PANEL: MASTER SWITCHLIGHT DEPRESSED, OPEN ON, MASTER AND TWO JETTISON BLUE DISAGREEMENT LIGHTS ON THEN OFF.
IF FUEL IN TANK IS LESS THAN JETTISON STOP LEVEL AS FOLLOWS:
TANK 1 OR 3: 10,350 TO 12,350 LBS
TANK 2L OR 2R: 3400 TO 4400 LBS
SIGNAL CONDITIONER BITE SWITCH IN MESC MUST BE HELD DOWN


DUMP BLUE DISAGREEMENT LIGHT ON STEADY
1 WARNING
OBSERVE ALL FUEL SYSTEM PRECAUTIONS. PLACE AN EMPTY CATCH BASIN UNDER JETTISON NOZZLES TO CATCH DRAINING FUEL. OPEN AND TAG: C33-U5 THRU U10, U13, U14
IS DUMP SWITCH DEPRESSED?
NO
YES
2 FOR TANKS 1 OR 3 OPEN ACCESS DOOR 541AB OR 641AB.
FOR TANKS 2L OR 2R OPEN ACCESS DOOR 541GB OR 641GB.
IS DEFUELING VALVE OPEN?
NO
YES
3 FOR TANKS 1 OR 3 OPEN ACCESS DOOR 541AB OR 641AB.
FOR TANKS 2L OR 2R OPEN ACCESS DOOR 541GB OR 641GB.
IS DEFUELING VALVE OPEN?
NO
YES
4 FOR TANKS 1 OR 3 REPLACE DEFUELING VALVE ACTUATOR (MM28-22-03).
FOR TANKS 2L OR 2R REPLACE DEFUELING VALVE PLUG-IN ASSEMBLY (MM28-22-02).
5 FOR TANKS 1 OR 3 REPLACE DEFUELING VALVE ACTUATOR (MM28-22-05).
IF FAULT PERSISTS REPLACE DEFUELING VALVE (MM28-22-04).
FOR TANKS 2L OR 2R REPLACE DEFUELING VALVE PLUG-IN ASSEMBLY (MM28-22-02).
6 FOR TANKS 1 OR 3 REPLACE DEFUELING VALVE ACTUATOR (MM28-22-05).
FOR TANKS 2L OR 2R REPLACE DEFUELING VALVE PLUG-IN ASSEMBLY (MM28-22-02).

M1-0001-28-569

R DUMP Blue Disagreement Light On Steady
R Figure 105

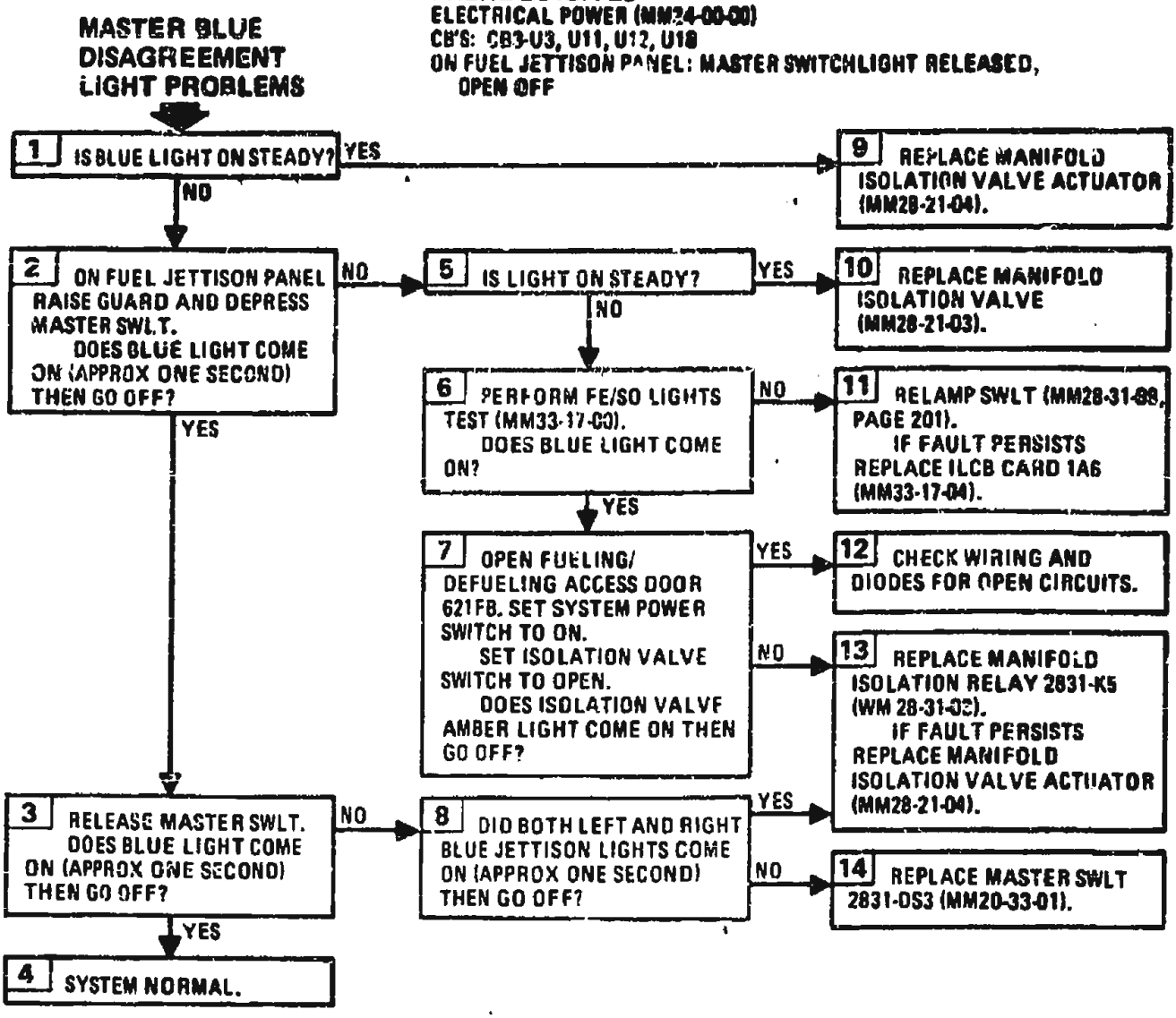
PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: CB3-T1 THRU T5, U8, U11, U13, U16
ON FUEL JETTISON PANEL: MASTER SWITCHLIGHT DEPRESSED, OPEN ON, MASTER AND TWO JETTISON BLUE DISAGREEMENT LIGHTS ON THEN OFF.
IF FUEL IN TANK IS LESS THAN JETTISON STOP LEVEL AS FOLLOWS:
TANK 1 OR 3: 10,350 TO 12,350 LBS
TANK 2L OR 2R: 3400 TO 4400 LBS
SIGNAL CONDITIONER BITE SWITCH IN WESC MUST BE HELD DOWN


DUMP BLUE DISAGREEMENT LIGHT ON STEADY
1
WARNING
OBSERVE ALL FUEL SYSTEM PRECAUTIONS. PLACE AN EMPTY CATCH BASIN UNDER JETTISUH NOZZLES TO CATCH DRAINING FUEL. OPEN AND TAG: CB3-U5 THRU U10, U13, U14
IS DUMP SWITCH DEPRESSED?
NO
2
FOR TANKS 1 OR 3 OPEN ACCESS DOOR 541AB OR 641AB.
FOR TANKS 2L OR 2R OPEN ACCESS DOOR 541GB OR 641GB.
IS DEFUELING VALVE OPEN?
NO
4
FOR TANKS 1 OR 3 REPLACE DEFUELING VALVE ACTUATOR (MM28-22-05).
FOR TANKS 2L OR 2R REPLACE DEFUELING VALVE PLUG-IN ASSEMBLY (MM28-22-02).
YES
5
FOR TANKS 1 OR 3 REPLACE DEFUELING VALVE ACTUATOR (MM28-22-05).
IF FAULT PERSISTS REPLACE DEFUELING VALVE (MM28-22-04).
FOR TANKS 2L OR 2R REPLACE DEFUELING VALVE PLUG-IN ASSEMBLY (MM28-22-02).
YES
3
FOR TANKS 1 OR 3 OPEN ACCESS DOOR 541AB OR 641AB.
FOR TANKS 2L OR 2R OPEN ACCESS DOOR 541GB OR 641GB.
IS DEFUELING VALVE OPEN?
NO
6
FOR TANKS 1 OR 3 REPLACE DEFUELING VALVE ACTUATOR (MM28-22-05).
FOR TANKS 2L OR 2R REPLACE DEFUELING VALVE PLUG-IN ASSEMBLY (MM28-22-02).

M1-0001-28-1124

R DUMP Blue Disagreement Light On Steady
R Figure 105

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: CB3-U3, U11, U12, U18
ON FUEL JETTISON PANEL: MASTER SWITCHLIGHT RELEASED, OPEN OFF


MASTER BLUE DISAGREEMENT LIGHT PROBLEMS
1 IS BLUE LIGHT ON STEADY?
YES
9 REPLACE MANIFOLD ISOLATION VALVE ACTUATOR (MM28-21-04).
NO
2 ON FUEL JETTISON PANEL RAISE GUARD AND DEPRESS MASTER SWLT. DOES BLUE LIGHT COME ON (APPROX ONE SECOND) THEN GO OFF?
NO
5 IS LIGHT ON STEADY?
YES
10 REPLACE MANIFOLD ISOLATION VALVE (MM28-21-03).
NO
6 PERFORM FE/SO LIGHTS TEST (MM33-17-00). DOES BLUE LIGHT COME ON?
NO
11 RELAMP SWLT (MM28-31-00, PAGE 201). IF FAULT PERSISTS REPLACE ILCB CARD 1A6 (MM33-17-04).
YES
YES
7 OPEN FUELING/ DEFUELING ACCESS DOOR 621FB. SET SYSTEM POWER SWITCH TO ON. SET ISOLATION VALVE SWITCH TO OPEN. DOES ISOLATION VALVE AMBER LIGHT COME ON THEN GO OFF?
YES
12 CHECK WIRING AND DIODES FOR OPEN CIRCUITS.
NO
13 REPLACE MANIFOLD ISOLATION RELAY 2831-K5 (WM 28-31-00). IF FAULT PERSISTS REPLACE MANIFOLD ISOLATION VALVE ACTUATOR (MM28-21-04).
YES
3 RELEASE MASTER SWLT. DOES BLUE LIGHT COME ON (APPROX ONE SECOND) THEN GO OFF?
NO
8 DID BOTH LEFT AND RIGHT BLUE JETTISON LIGHTS COME ON (APPROX ONE SECOND) THEN GO OFF?
YES
14 REPLACE MASTER SWLT 2831-0S3 (MM20-33-01).
NO
YES
4 SYSTEM NORMAL.

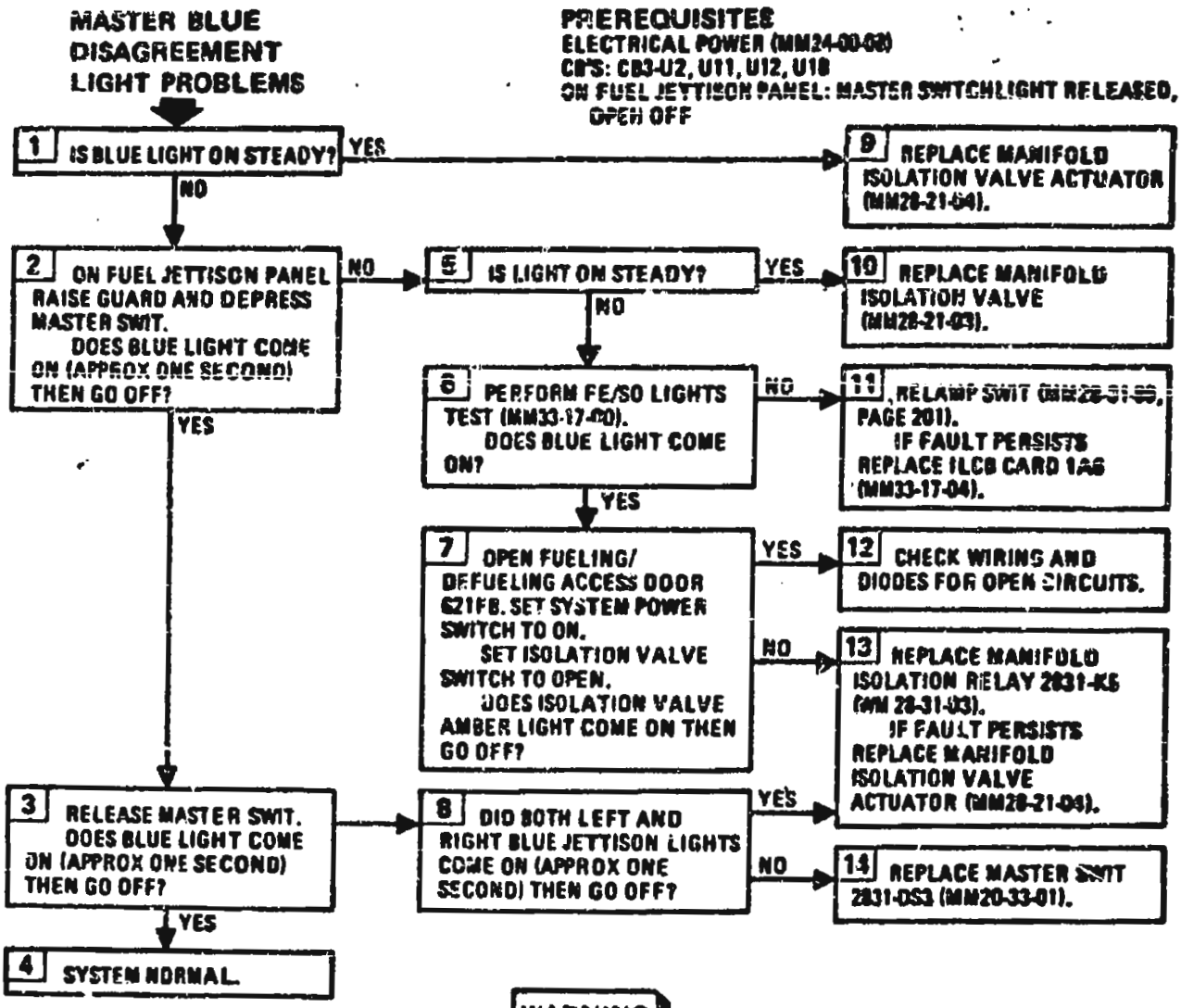
WARNING

OBSERVE ALL FUEL SYSTEM PRECAUTIONS
PLACE AN EMPTY CATCH BASIN UNDER JETTISON NOZZLES TO CATCH DRAINING FUEL
OPEN AND TAG: CB3-U5 THRU U10, U13, U14

M1-47303-28-515

R MASTER Blue Disagreement Light Problems
R Figure 106

R EFFECTIVITY: 001-024, 027
R
001B

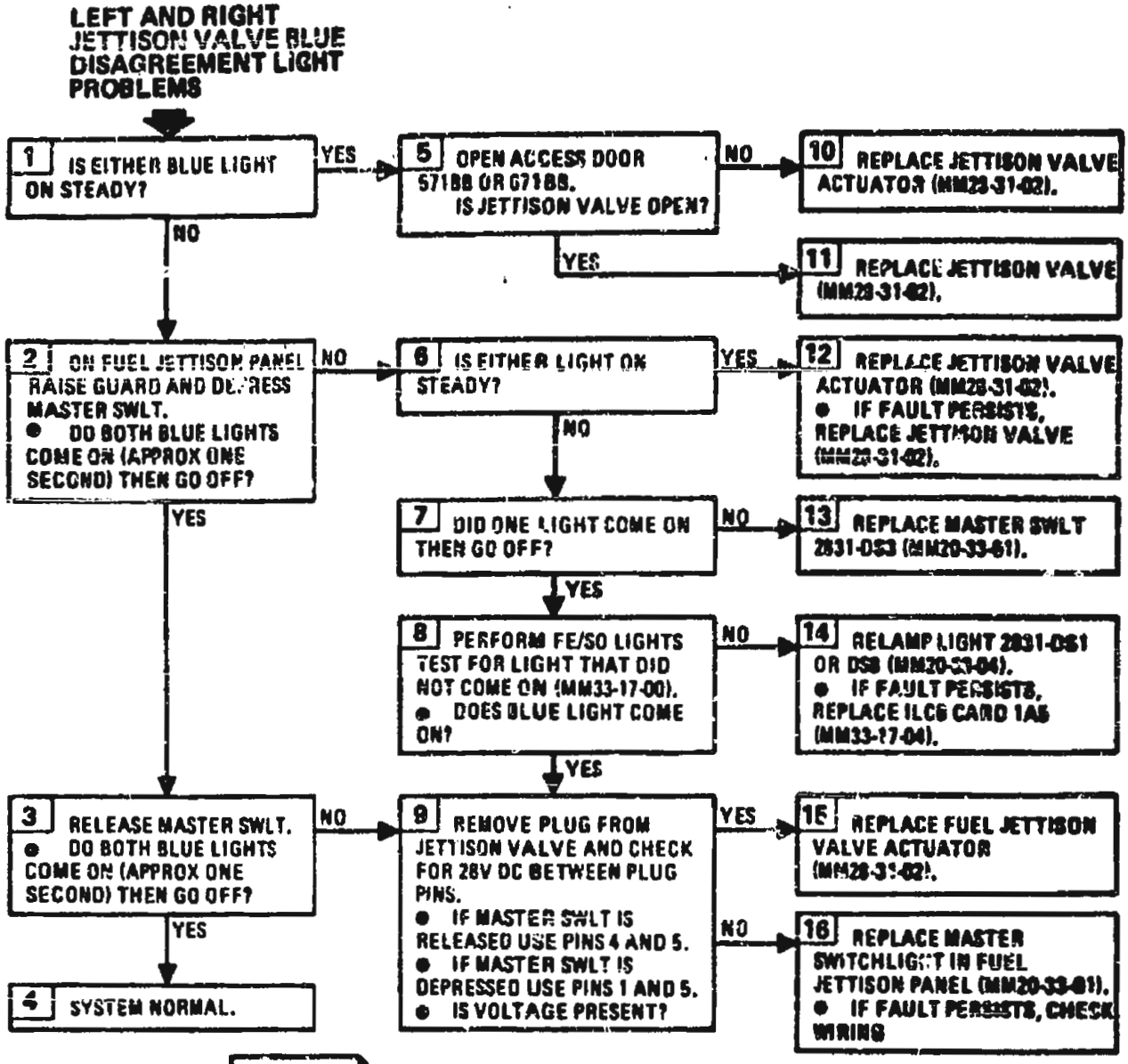

MASTER BLUE DISAGREEMENT LIGHT PROBLEMS
PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: CB3-U2, U11, U12, U18
ON FUEL JETTISON PANEL: MASTER SWITCHLIGHT RELEASED, OPEN OFF
1 IS BLUE LIGHT ON STEADY?
YES
NO
9 REPLACE MANIFOLD ISOLATION VALVE ACTUATOR (MM28-21-04).
2 ON FUEL JETTISON PANEL RAISE GUARD AND DEPRESS MASTER SWIT. DOES BLUE LIGHT COME ON (APPROX ONE SECOND) THEN GO OFF?
NO
5 IS LIGHT ON STEADY?
YES
10 REPLACE MANIFOLD ISOLATION VALVE (MM28-21-03).
NO
6 PERFORM FE/SO LIGHTS TEST (MM33-17-00). DOES BLUE LIGHT COME ON?
NO
11 RELAMP SWIT (MM28-31-00, PAGE 201). IF FAULT PERSISTS REPLACE ILCB CARD 1A6 (MM33-17-04).
YES
7 OPEN FUELING/ DEFUELING ACCESS DOOR 621FB. SET SYSTEM POWER SWITCH TO ON. SET ISOLATION VALVE SWITCH TO OPEN. DOES ISOLATION VALVE AMBER LIGHT COME ON THEN GO OFF?
YES
12 CHECK WIRING AND DIODES FOR OPEN CIRCUITS.
NO
13 REPLACE MANIFOLD ISOLATION RELAY 2831-K5 (MM 28-31-03). IF FAULT PERSISTS REPLACE MANIFOLD ISOLATION VALVE ACTUATOR (MM28-21-04).
YES
NO
3 RELEASE MASTER SWIT. DOES BLUE LIGHT COME ON (APPROX ONE SECOND) THEN GO OFF?
8 DID BOTH LEFT AND RIGHT BLUE JETTISON LIGHTS COME ON (APPROX ONE SECOND) THEN GO OFF?
YES
14 REPLACE MASTER SWIT 2831-0S3 (MM20-33-01).
NO
4 SYSTEM NORMAL.

WARNING

OBSERVE ALL FUEL SYSTEM PRECAUTIONS.
PLACE AN EMPTY CATCH BASIN UNDER JETTISON NOZZLES TO CATCH DRAINING FUEL.
OPEN AND TAG: CB3-U3, U4, U7 THRU U10, U13, U14.

M1-38703-28-1100

MASTER Blue Disagreement Light Problems
Figure 106


LEFT AND RIGHT JETTISON VALVE BLUE DISAGREEMENT LIGHT PROBLEMS
1 IS EITHER BLUE LIGHT ON STEADY?
YES
5 OPEN ACCESS DOOR 5718B OR 6718B. IS JETTISON VALVE OPEN?
NO
10 REPLACE JETTISON VALVE ACTUATOR (MM28-31-02).
YES
11 REPLACE JETTISON VALVE (MM28-31-02).
NO
2 ON FUEL JETTISON PANEL RAISE GUARD AND DEPRESS MASTER SWLT.
● DO BOTH BLUE LIGHTS COME ON (APPROX ONE SECOND) THEN GO OFF?
NO
6 IS EITHER LIGHT ON STEADY?
YES
12 REPLACE JETTISON VALVE ACTUATOR (MM28-31-02).
● IF FAULT PERSISTS, REPLACE JETTISON VALVE (MM28-31-02).
NO
7 DID ONE LIGHT COME ON THEN GO OFF?
NO
13 REPLACE MASTER SWLT 2831-053 (MM20-33-61).
YES
8 PERFORM FE/SO LIGHTS TEST FOR LIGHT THAT DID NOT COME ON (MM33-17-00).
● DOES BLUE LIGHT COME ON?
NO
14 RELAMP LIGHT 2831-051 OR 058 (MM20-33-04).
● IF FAULT PERSISTS, REPLACE ILCS CARD 1A5 (MM33-17-04).
YES
YES
3 RELEASE MASTER SWLT.
● DO BOTH BLUE LIGHTS COME ON (APPROX ONE SECOND) THEN GO OFF?
NO
9 REMOVE PLUG FROM JETTISON VALVE AND CHECK FOR 28V DC BETWEEN PLUG PINS.
● IF MASTER SWLT IS RELEASED USE PINS 4 AND 5.
● IF MASTER SWLT IS DEPRESSED USE PINS 1 AND 5.
● IS VOLTAGE PRESENT?
YES
15 REPLACE FUEL JETTISON VALVE ACTUATOR (MM28-31-02).
NO
16 REPLACE MASTER SWITCHLIGHT IN FUEL JETTISON PANEL (MM20-33-61).
● IF FAULT PERSISTS, CHECK WIRING
YES
4 SYSTEM NORMAL.

WARNING

- OBSERVE ALL FUEL SYSTEM PRECAUTIONS
- PLACE AN EMPTY CATCH BASIN UNDER JETTISON NOZZLES TO CATCH DRAINING FUEL
- OPEN AND TAG: CB3-U5 THRU U10, U13, U14

PREREAUISITES

ELECTRICAL POWER (MM24-00-00)
CB'S: CB3-U3, U11, U12, U18
ON FUEL JETTISON PANEL: MASTER SWITCHLIGHT RELEASED, OPEN OFF

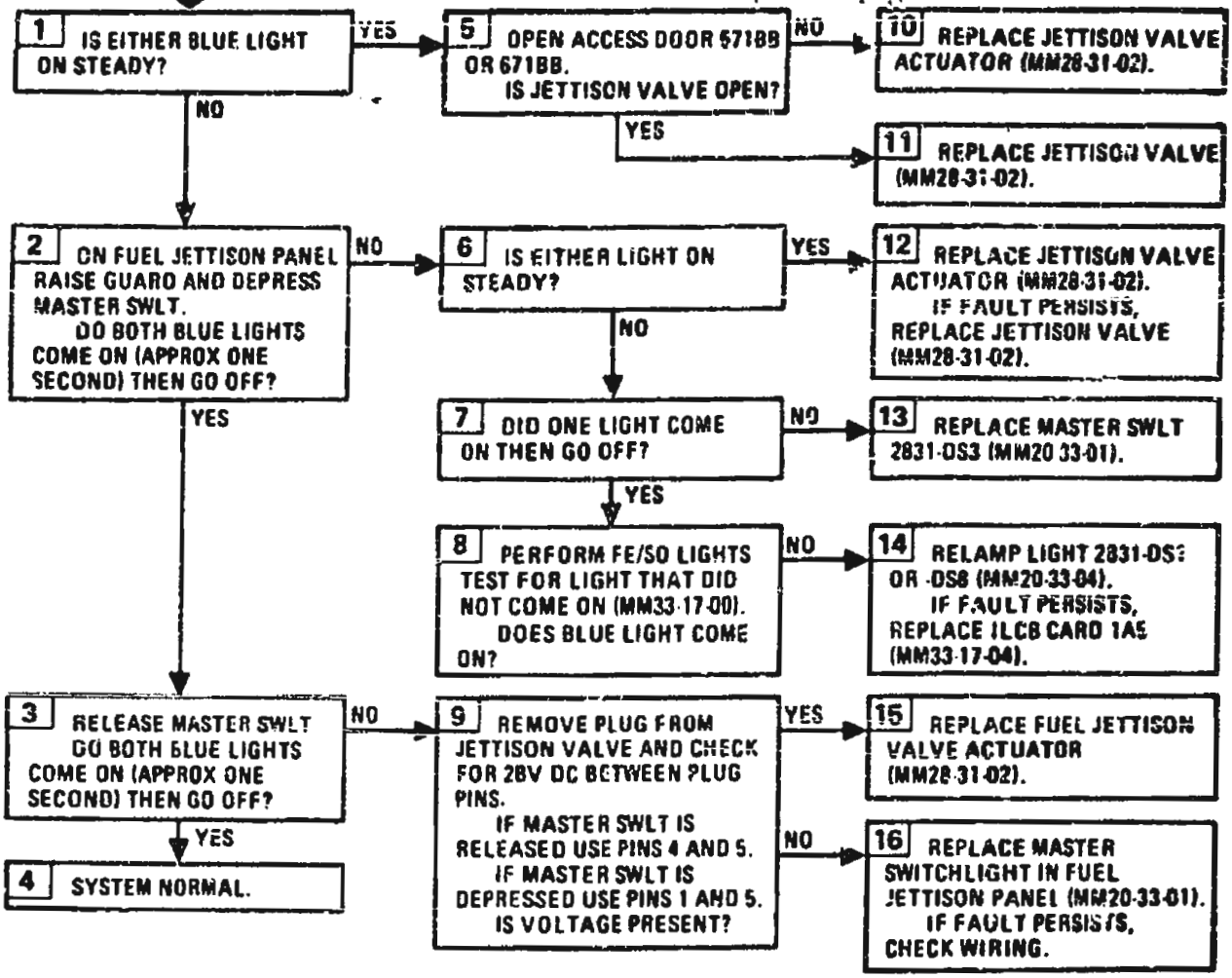
M1-07304-28-820

R Left and Right Jettison Valve Blue Disagreement Light Problems
R Figure 107

R EFFECTIVITY: 001-024, 027

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: CB3-U2, U11, U12, U18
ON FUEL JETTISON PANEL: MASTER SWITCHLIGHT RELEASED, OPEN OFF

LEFT AND RIGHT JETTISON VALVE BLUE DISAGREEMENT LIGHT PROBLEMS

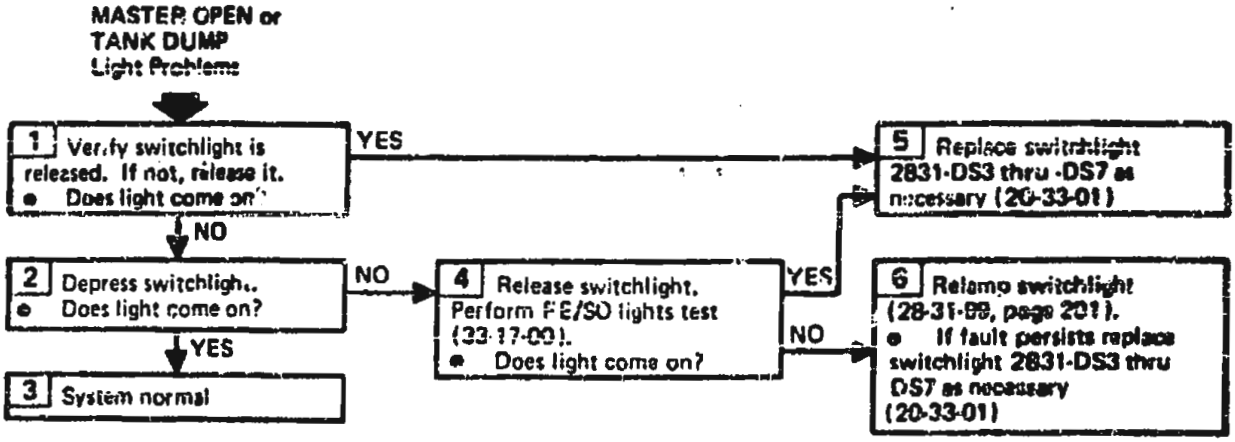

1 IS EITHER BLUE LIGHT ON STEADY?
YES
5 OPEN ACCESS DOOR 5718B OR 6718B. IS JETTISON VALVE OPEN?
NO
10 REPLACE JETTISON VALVE ACTUATOR (MM28-31-02).
YES
11 REPLACE JETTISON VALVE (MM28-31-02).
NO
2 ON FUEL JETTISON PANEL RAISE GUARD AND DEPRESS MASTER SWLT. DO BOTH BLUE LIGHTS COME ON (APPROX ONE SECOND) THEN GO OFF?
NO
6 IS EITHER LIGHT ON STEADY?
YES
12 REPLACE JETTISON VALVE ACTUATOR (MM28-31-02). IF FAULT PERSISTS, REPLACE JETTISON VALVE (MM28-31-02).
NO
7 DID ONE LIGHT COME ON THEN GO OFF?
NO
13 REPLACE MASTER SWLT 2831-DS3 (MM20-33-01).
YES
8 PERFORM FE/SO LIGHTS TEST FOR LIGHT THAT DID NOT COME ON (MM33-17-00). DOES BLUE LIGHT COME ON?
NO
14 RELAMP LIGHT 2831-DS3 OR -DS8 (MM20-33-04). IF FAULT PERSISTS, REPLACE ILCB CARD 1A5 (MM33-17-04).
YES
3 RELEASE MASTER SWLT DO BOTH BLUE LIGHTS COME ON (APPROX ONE SECOND) THEN GO OFF?
NO
9 REMOVE PLUG FROM JETTISON VALVE AND CHECK FOR 28V DC BETWEEN PLUG PINS. IF MASTER SWLT IS RELEASED USE PINS 4 AND 5. IF MASTER SWLT IS DEPRESSED USE PINS 1 AND 5. IS VOLTAGE PRESENT?
YES
15 REPLACE FUEL JETTISON VALVE ACTUATOR (MM28-31-02).
NO
16 REPLACE MASTER SWITCHLIGHT IN FUEL JETTISON PANEL (MM20-33-01). IF FAULT PERSISTS, CHECK WIRING.
YES
4 SYSTEM NORMAL.

WARNING

OBSERVE ALL FUEL SYSTEM PRECAUTIONS.
PLACE AN EMPTY CATCH BASIN UNDER JETTISON NOZZLES TO CATCH DRAINING FUEL.
OPEN AND TAG: CB3-U3, U4, U7 THRU U10, U13, U14.

M1-39703-28-1113

Left and Right Jettison Valve Blue Disagreement Light Problems
Figure 107


MASTER OPEN or
TANK DUMP
Light Problems
1 Verify switchlight is released. If not, release it.
• Does light come on?
YES
5 Replace switchlight 2831-DS3 thru -DS7 as necessary (20-33-01)
NO
2 Depress switchligh..
• Does light come on?
NO
4 Release switchlight. Perform FE/SO lights test (33-17-00).
• Does light come on?
YES
6 Relamp switchlight (28-31-99, page 201).
• If fault persists replace switchlight 2831-DS3 thru DS7 as necessary (20-33-01)
NO
YES
3 System normal

WARNING

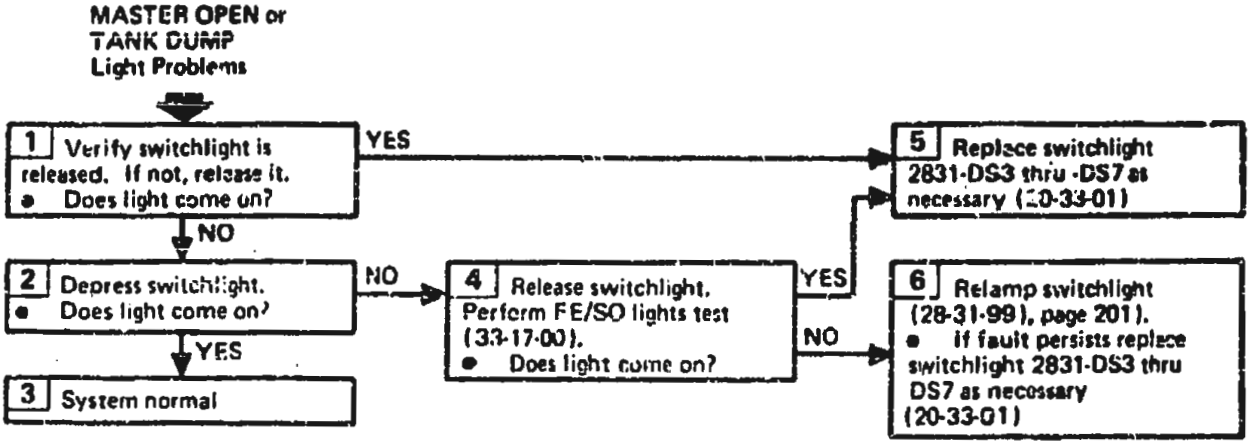
- OBSERVE ALL FUEL SYSTEM PRECAUTIONS.
- PLACE AN EMPTY CATCH BASIN UNDER JETTISON NOZZLES TO CATCH DRAINING FUEL.
- OPEN AND TAG: CB3-U5 THRU U10, U13, U14, U18.

PREREQUISITES
Electrical power (24-00-00)
CB's: CB2-H5, J4

M1-37501-28-521

R MASTER OPEN or TANK DUMP Light Problems
R Figure 108

R EFFECTIVITY: 001-024, 027
R
001B


MASTER OPEN or
TANK DUMP
Light Problems
1 Verify switchlight is released. If not, release it.
• Does light come on?
YES
5 Replace switchlight 2831-DS3 thru -DS7 as necessary (20-33-01)
NO
2 Depress switchlight.
• Does light come on?
NO
4 Release switchlight. Perform FE/SO lights test (33-17-00).
• Does light come on?
YES
NO
6 Relamp switchlight (28-31-99), page 201).
• If fault persists replace switchlight 2831-DS3 thru DS7 as necessary (20-33-01)
YES
3 System normal

WARNING

- OBSERVE ALL FUEL SYSTEM PRECAUTIONS.
- PLACE AN EMPTY CATCH BASIN UNDER JETTISON NOZZLES TO CATCH DRAINING FUEL.
- OPEN AND TAG: CB3-U3, U4, U7 THRU U10, U13, U14, U18

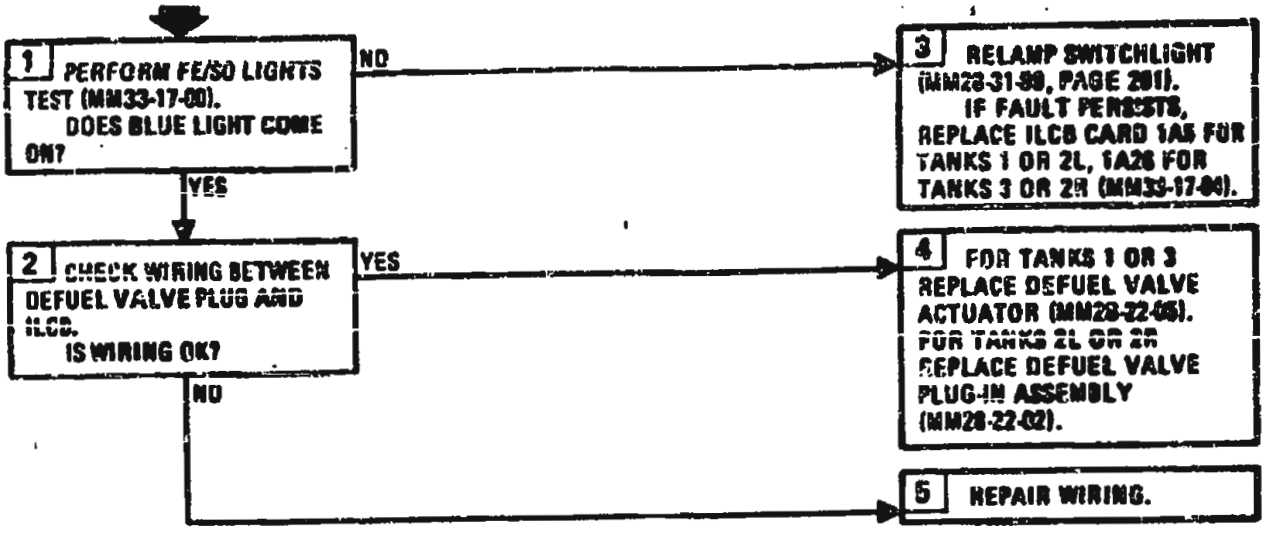
PREREQUISITES
Electrical power (24-00-00)
CB's: CB2-H5, J4

M1-39701-28-1112

MASTER OPEN or TANK DUMP Light Problems
Figure 108

DUMP BLUE LIGHT DID NOT COME ON WHEN SWITCHLIGHT RELEASED (DUMPING STOPPED)

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: CB3-T1 THRU T5, U3, U11, U12, U18


1 PERFORM FE/SO LIGHTS TEST (MM33-17-00). DOES BLUE LIGHT COME ON?
NO
YES
2 CHECK WIRING BETWEEN DEFUEL VALVE PLUG AND ILCB. IS WIRING OK?
YES
NO
3 RELAMP SWITCHLIGHT (MM28-31-00, PAGE 201). IF FAULT PERSISTS, REPLACE ILCB CARD 1A5 FOR TANKS 1 OR 2L, 1A26 FOR TANKS 3 OR 2R (MM33-17-00).
4 FOR TANKS 1 OR 3 REPLACE DEFUEL VALVE ACTUATOR (MM28-22-05). FOR TANKS 2L OR 2R REPLACE DEFUEL VALVE PLUG-IN ASSEMBLY (MM28-22-02).
5 REPAIR WIRING.

WARNING

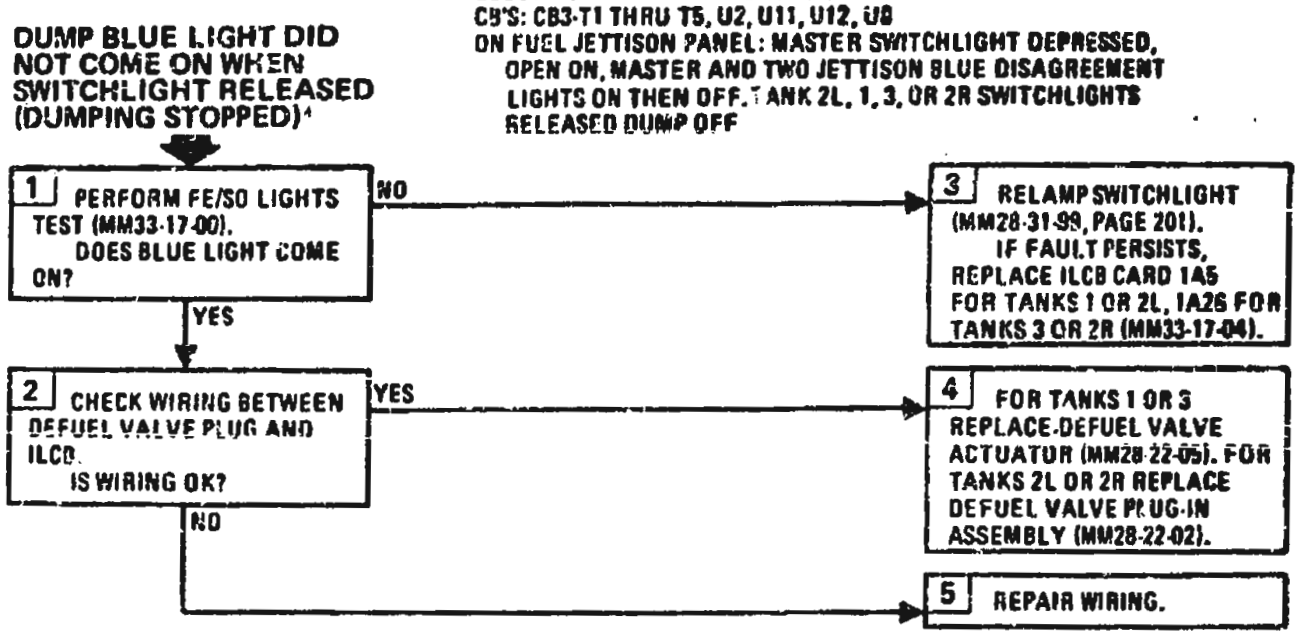
OBSERVE ALL FUEL SYSTEM PRECAUTIONS.
PLACE AN EMPTY CATCH BASIN UNDER JETTISON NOZZLES TO CATCH DRAINING FUEL
OPEN AND TAG: CB3-U5 THRU U10, U13, U14

NOTE
ON FUEL FETTISON PANEL: MASTER SWITCHLIGHT DEPRESSED, OPEN LIGHT ON, MASTER AND TWO JETTISON BLUE DISAGREEMENT LIGHTS ON THEN OFF. TANK 2L, 1, 3, OR 2R SWITCHLIGHTS RELEASED DUMP LIGHT OUT

M1-47301-28-004

R DUMP Blue Light Did Not Come On When Switchlight Released
R Figure 109

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: CB3-T1 THRU T5, U2, U11, U12, U8
ON FUEL JETTISON PANEL: MASTER SWITCHLIGHT DEPRESSED, OPEN ON, MASTER AND TWO JETTISON BLUE DISAGREEMENT LIGHTS ON THEN OFF. TANK 2L, 1, 3, OR 2R SWITCHLIGHTS RELEASED DUMP OFF

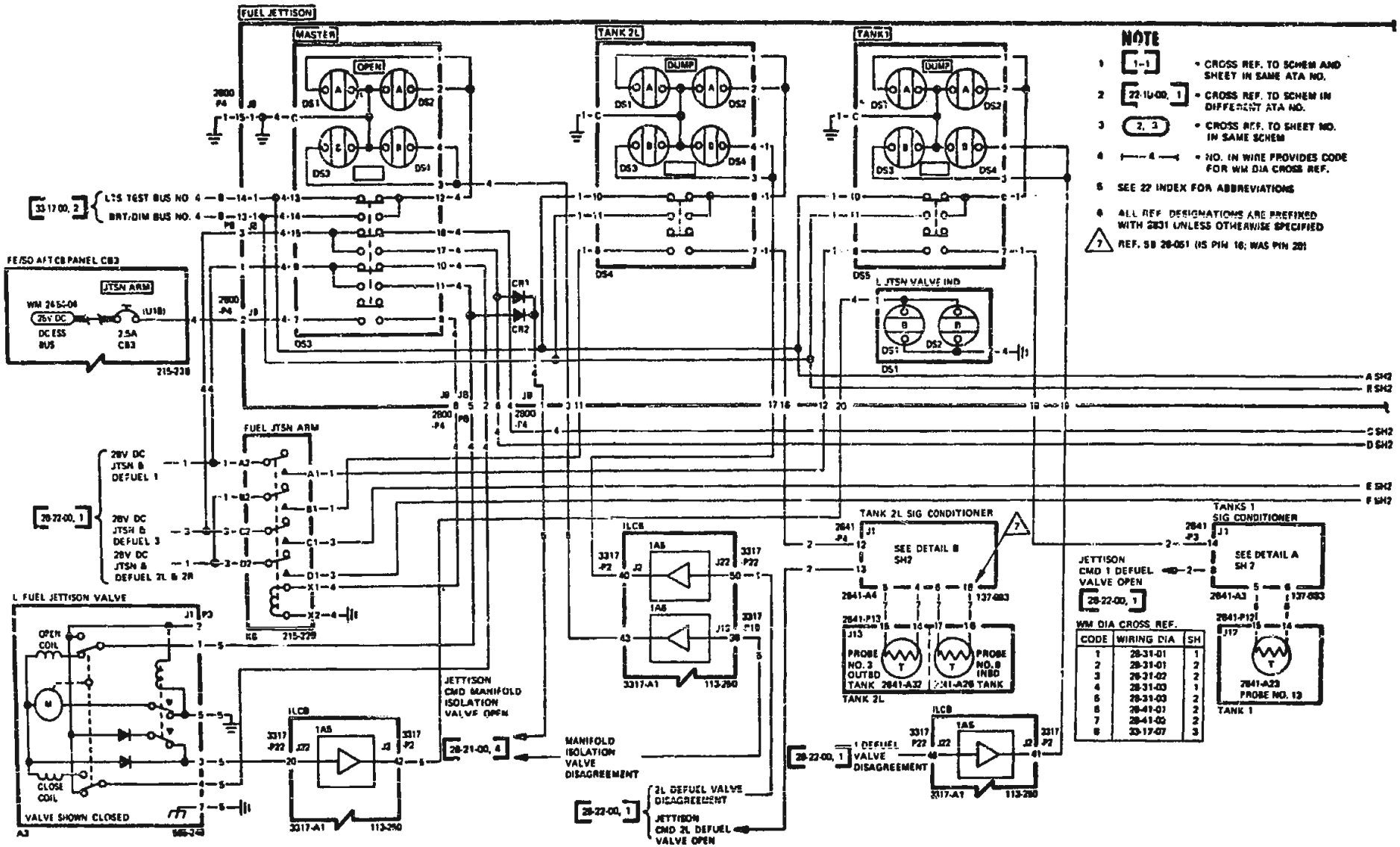

DUMP BLUE LIGHT DID NOT COME ON WHEN SWITCHLIGHT RELEASED (DUMPING STOPPED)
1 PERFORM FE/SO LIGHTS TEST (MM33-17-00). DOES BLUE LIGHT COME ON?
NO
YES
3 RELAMP SWITCHLIGHT (MM28-31-99, PAGE 201). IF FAULT PERSISTS, REPLACE ILCB CARD 1A5 FOR TANKS 1 OR 2L, 1A26 FOR TANKS 3 OR 2R (MM33-17-04).
2 CHECK WIRING BETWEEN DEFUEL VALVE PLUG AND ILCB. IS WIRING OK?
YES
NO
4 FOR TANKS 1 OR 3 REPLACE DEFUEL VALVE ACTUATOR (MM28-22-05). FOR TANKS 2L OR 2R REPLACE DEFUEL VALVE PLUG-IN ASSEMBLY (MM28-22-02).
5 REPAIR WIRING.

WARNING

OBSERVE ALL FUEL SYSTEM PRECAUTIONS.
PLACE AN EMPTY CATCH BASIN UNDER JETTISON NOZZLES TO CATCH DRAINING FUEL.
OPEN AND TAG: CB3-U3, U4, U7 THRU U10, U13, U14.

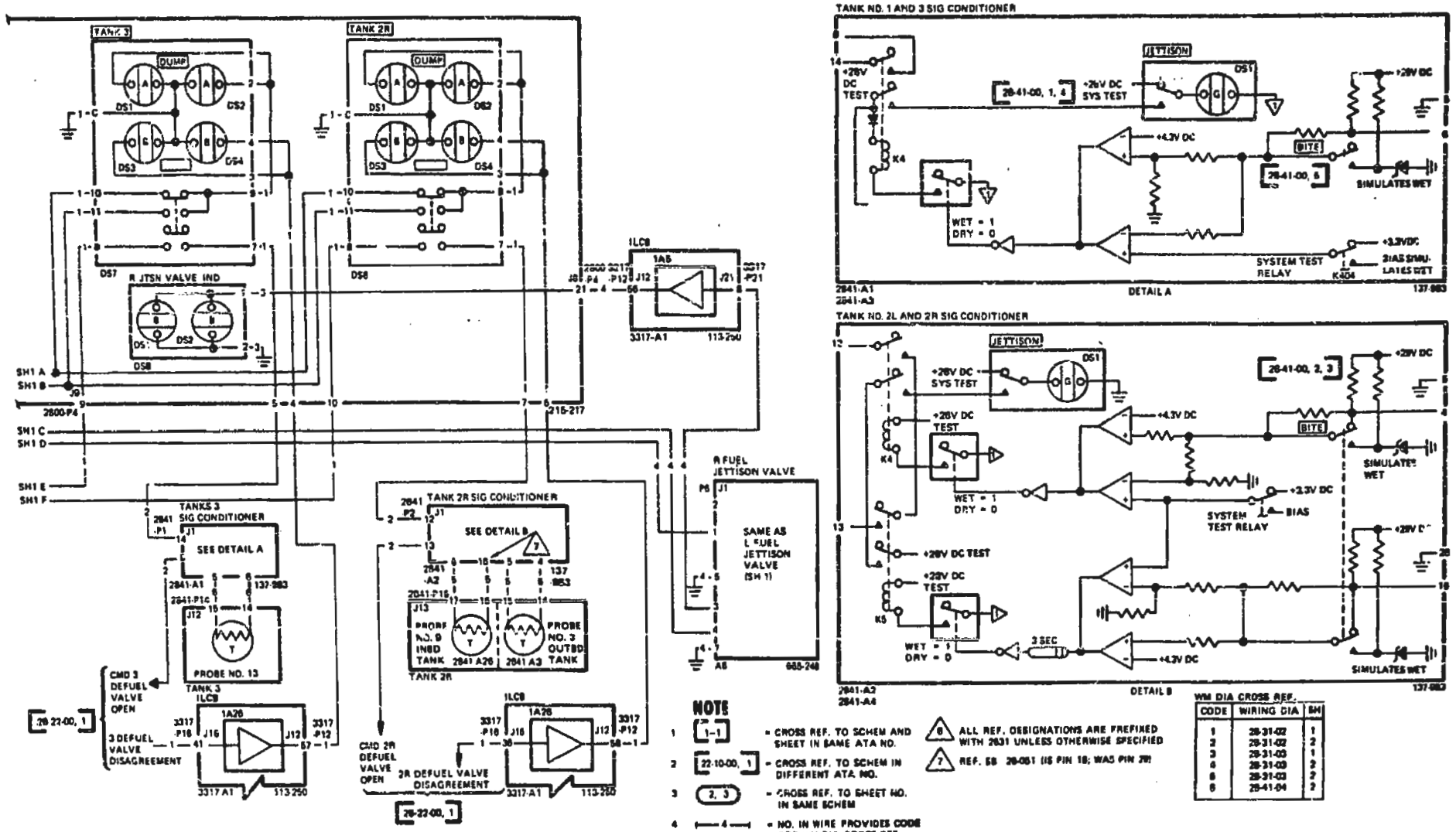
M1-39701-28-1133

DUMP Blue Light Did Not Come On When Switchlight Released
Figure 109


FUEL JETTISON
MASTER
TANK 2L
TANK 1
OPEN
DUMP
NOTE
1 [1-1] • CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2 [22-10-00, 1] • CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3 (2, 3) • CROSS REF. TO SHEET NO. IN SAME SCHEM
4 —4— • NO. IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.
5 SEE 22' INDEX FOR ABBREVIATIONS
6 ALL REF. DESIGNATIONS ARE PREFIXED WITH 2831 UNLESS OTHERWISE SPECIFIED
7 REF. SB 28-051 (IS PIN 16; WAS PIN 20)
L T/S TEST BUS NO 4
BRT/DIM BUS NO. 4
FE/SO AFT CB PANEL CB3
JTSN ARM
28V DC
DC ESS BUS
2.5A CB3
L JTSN VALVE IND
FUEL JTSN ARM
28V DC JTSN & DEFUEL 1
28V DC JTSN & DEFUEL 3
28V DC JTSN & DEFUEL 2L & 2R
L FUEL JETTISON VALVE
OPEN COIL
CLOSE COIL
VALVE SHOWN CLOSED
JETTISON CMD MANIFOLD ISOLATION VALVE OPEN
MANIFOLD ISOLATION VALVE DISAGREEMENT
2L DEFUEL VALVE DISAGREEMENT
JETTISON CMD 2L DEFUEL VALVE OPEN
TANK 2L SIG CONDITIONER
SEE DETAIL B SH2
PROBE NO. 3 OUTBD TANK
PROBE NO. 8 INBD TANK
TANK 2L
TANKS 1 SIG CONDITIONER
SEE DETAIL A SH 2
PROBE NO. 13
TANK 1
JETTISON CMD 1 DEFUEL VALVE OPEN
1 DEFUEL VALVE DISAGREEMENT
WM DIA CROSS REF.
CODE | WIRING DIA | SH
1 | 28-31-01 | 1
2 | 28-31-01 | 2
3 | 28-31-02 | 2
4 | 28-31-03 | 1
5 | 28-31-03 | 2
6 | 28-41-01 | 2
7 | 28-41-02 | 2
8 | 33-17-07 | 3
A SH2
B SH2
C SH2
D SH2
E SH2
F SH2

Fuel Jettison System Schematic
SCHEM 1 (Sheet 1)

EFFECTIVITY: 001-024, 027



NOTE

1. [-1] = CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2. [22-10-00, 1] = CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3. (2, 3) = CROSS REF. TO SHEET NO. IN SAME SCHEM
4. —4— = NO. IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.
5. SEE 22 INDEX FOR ABBREVIATIONS

6. ALL REF. DESIGNATIONS ARE PREFIXED WITH 2631 UNLESS OTHERWISE SPECIFIED
7. REF. SB 28-051 (IS PIN 18; WAS PIN 20)

WM DIA CROSS REF.

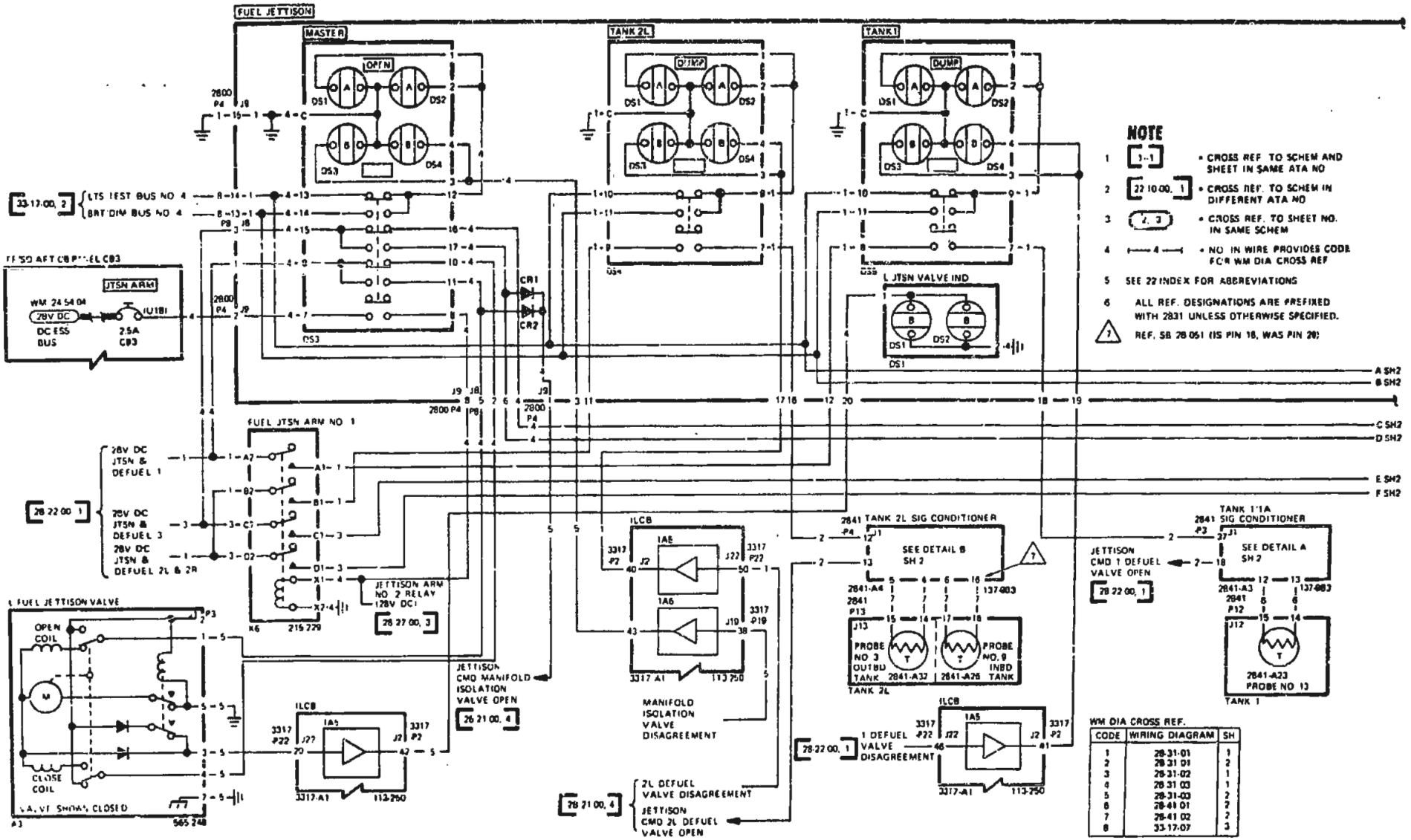
CODE	WIRING DIA	SH
1	28-31-02	1
2	28-31-02	2
3	28-31-03	1
4	28-31-03	2
5	28-31-03	2
6	28-41-04	2

EM1-0003-28-612

R R Fuel Jettison System Schematic
SCHEM 1 (Sheet 2)

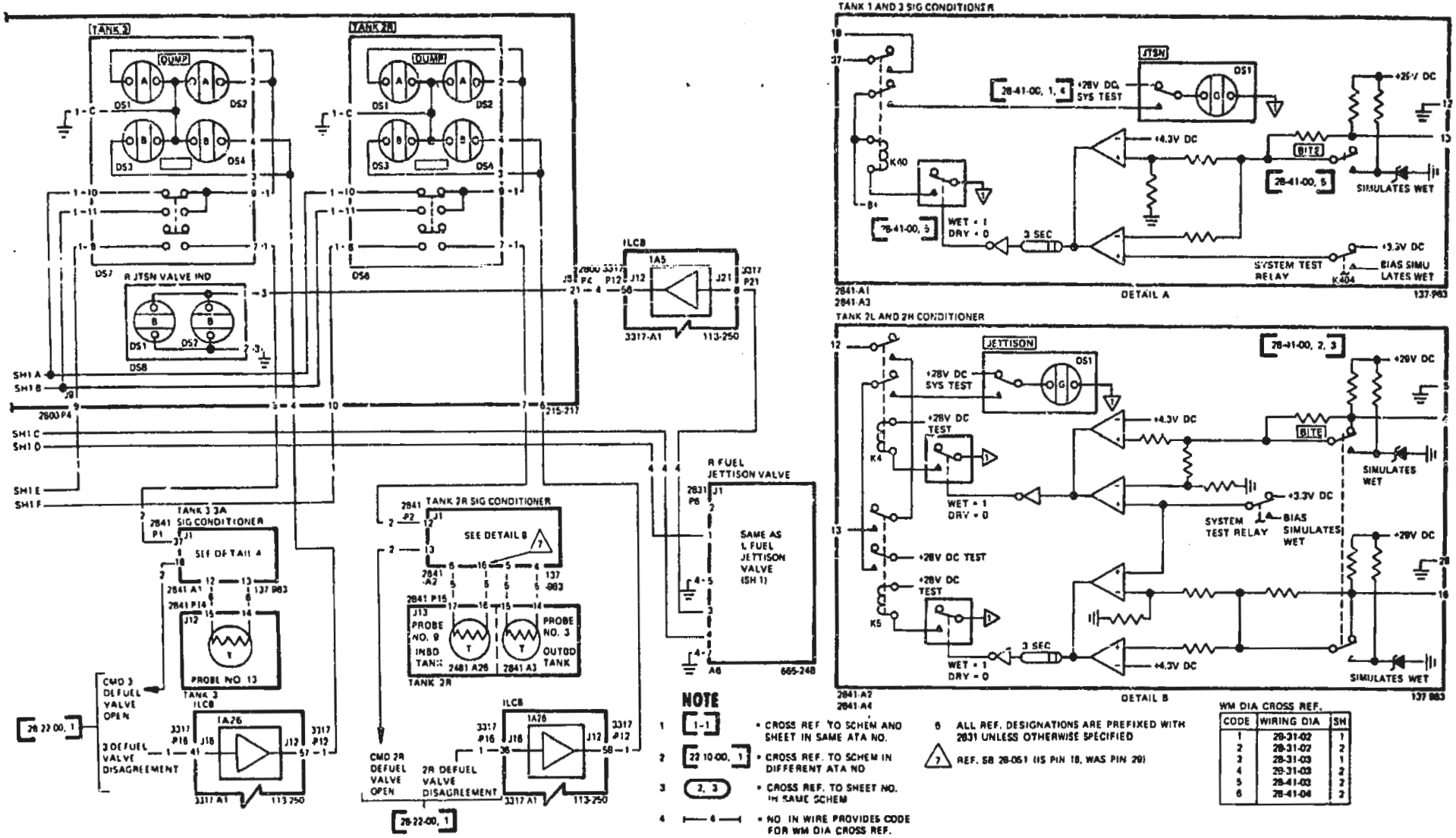
R R EFFECTIVITY: 001-024, 027

001B


FUEL JETTISON
MASTER
OPEN
TANK 2L
DUMP
TANK 1
DUMP
NOTE
1 1-1 • CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO
2 22 10 00, 1 • CROSS REF. TO SCHEM IN DIFFERENT ATA NO
3 2, 3 • CROSS REF. TO SHEET NO. IN SAME SCHEM
4 4 • NO. IN WIRE PROVIDES CODE FOR WM DIA CROSS REF
5 SEE 22 INDEX FOR ABBREVIATIONS
6 ALL REF. DESIGNATIONS ARE PREFIXED WITH 2831 UNLESS OTHERWISE SPECIFIED.
7 REF. SB 28 051 (IS PIN 16, WAS PIN 20)
33 17 00, 2
LTS TEST BUS NO 4
BRT DIM BUS NO 4
JTSN ARM
WM 24 54 04
28V DC
DC ESS BUS
2.5A CB3
L JTSN VALVE IND
FUEL JTSN ARM NO 1
28V DC JTSN & DEFUEL 1
28V DC JTSN & DEFUEL 3
28V DC JTSN & DEFUEL 2L & 2R
28 22 00, 1
JETTISON ARM NO 2 RELAY (28V DC)
28 27 00, 3
L FUEL JETTISON VALVE
OPEN COIL
CLOSE COIL
VALVE SHOWN CLOSED
JETTISON CMD MANIFOLD ISOLATION VALVE OPEN
28 21 00, 4
ILCB
MANIFOLD ISOLATION VALVE DISAGREEMENT
2841 TANK 2L SIG CONDITIONER
SEE DETAIL B SH 2
PROBE NO 3 OUTBD TANK
PROBE NO 9 INBD TANK
TANK 2L
2L DEFUEL VALVE DISAGREEMENT
JETTISON CMD 2L DEFUEL VALVE OPEN
1 DEFUEL VALVE DISAGREEMENT
TANK 1 SIG CONDITIONER
SEE DETAIL A SH 2
JETTISON CMD 1 DEFUEL VALVE OPEN
2841-A23 PROBE NO 13
TANK 1
WM DIA CROSS REF.
CODE | WIRING DIAGRAM | SH
1 | 28-31-01 | 1
2 | 28-31-01 | 2
3 | 28-31-02 | 1
4 | 28-31-03 | 1
5 | 28-31-03 | 2
6 | 28-41-01 | 2
7 | 28-41-02 | 2
8 | 33-17-07 | 3
A SH2
B SH2
C SH2
D SH2
E SH2
F SH2

Fuel Jettison System Schematic
SCHEM 1 (Sheet 1)

R EFFECTIVITY: 025, 026, 028-999
R
0018



NOTE

1. [1-1] • CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2. [22 10-00, 1] • CROSS REF. TO SCHEM IN DIFFERENT ATA NO
3. [2, 3] • CROSS REF. TO SHEET NO. IN SAME SCHEM
4. —6— • NO IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.
5. SEE 22 INDEX FOR ABBREVIATIONS
6. ALL REF. DESIGNATIONS ARE PREFIXED WITH 2831 UNLESS OTHERWISE SPECIFIED
7. REF. SB 28-051 (IS PIN 18, WAS PIN 29)

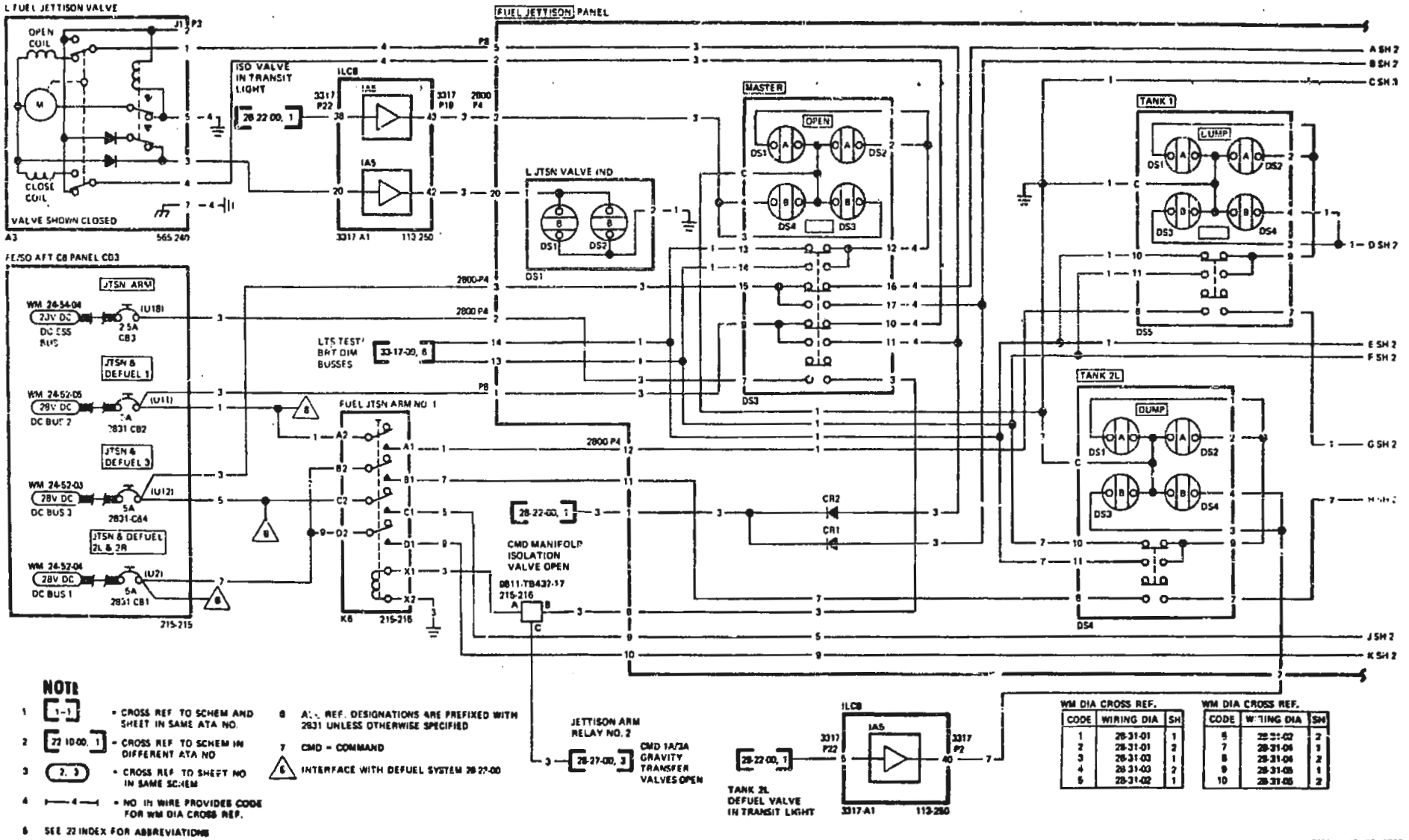
WM DIA CROSS REF.

CODE	WIRING DIA	SH
1	28-31-02	1
2	28-31-02	2
3	28-31-03	1
4	28-31-03	2
5	28-41-03	2
6	28-41-04	2

EM1-0005-28-1007

Fuel Jettison System Schematic
SCHEM 1 (Sheet 2)

R EFFECTIVITY: 025, 026, 028-999
R
001B



NOTE

1. [1-1] - CROSS REF TO SCHEM AND SHEET IN SAME ATA NO.
2. [22 10-00, 1] - CROSS REF TO SCHEM IN DIFFERENT ATA NO
3. [2, 3] - CROSS REF TO SHEET NO IN SAME SCHEM
4. —4— - NO IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.
5. SEE 22 INDEX FOR ABBREVIATIONS
6. ALL REF. DESIGNATIONS ARE PREFIXED WITH 2831 UNLESS OTHERWISE SPECIFIED
7. CMD = COMMAND
8. INTERFACE WITH DEFUEL SYSTEM 28-27-00

WM DIA CROSS REF.

CODE	WIRING DIA	SH
1	28-31-01	1
2	28-31-01	2
3	28-31-03	1
4	28-31-03	2
5	28-31-02	1

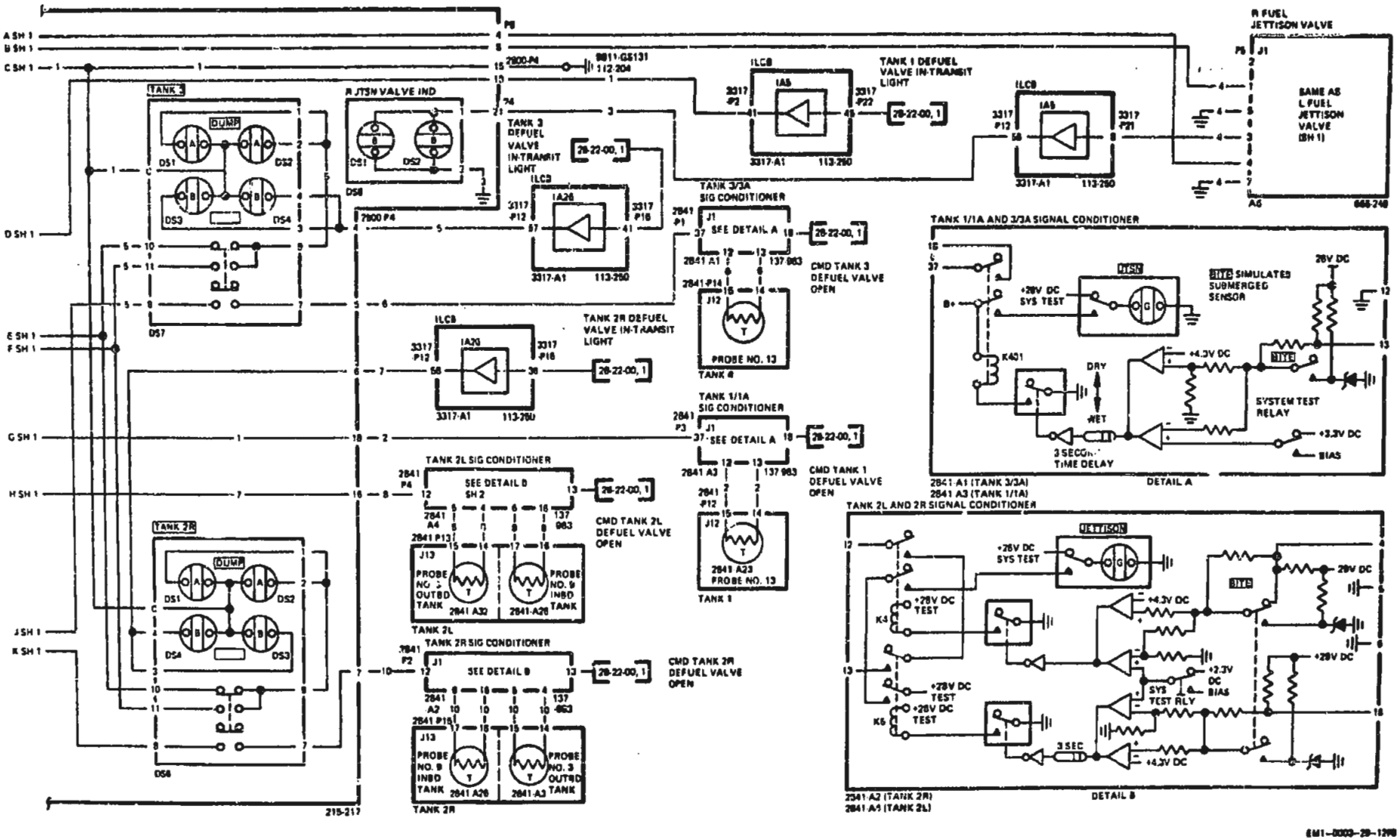
WM DIA CROSS REF.

CODE	WIRING DIA	SH
6	28-31-02	2
7	28-31-04	1
8	28-31-04	2
9	28-31-05	1
10	28-31-05	2

EM1-0002-28-1207

R R Fuel Jettison System Schematic
SCHEM 1 (Sheet 1)

R R 001B EFFECTIVITY: 032-999



Fuel Jettison System Schematic
SCHEM 1 (Sheet 2)

EFFECTIVITY: 032-999

001B

FUEL JETTISON SYSTEM - ADJUSTMENT AND TEST

1. General

In-flight fuel jettisoning is accomplished by diverting a portion of each tank boost pump output through the tank defuel valves and cross-ship refuel/defuel manifold (Ref. 28-22-00) to fuel jettison valves in each outer wing panel. Fuel is ejected overboard well aft of the wing trailing edge through the opened jettison valve, and jettison masts having flame arrestor equipped nozzles. The operation is controlled by the FE/SO using five guarded switchlights located on the FE/SO FUEL JETTISON panel.

If not terminated sooner, fuel jettisoning is automatically cutoff by the fuel quantity signal conditioners which will close the respective tank defuel valve. This occurs at a fuel level predetermined by the location of jettison stop sensors (thermistors) mounted on fuel probes No. 3, 9, and 13 (Ref. 28-41-00).

R

Self test (BITE) provisions on the fuel quantity signal conditioners verify continuity of the thermistor sensor circuit, and functionally checks the defuel valve control circuitry in the signal conditioner.

C 2. Referenced Procedures

6-40-00	External Access Doors and Panels - Maintenance Practices
24-00-00	Electrical Power System - Maintenance Practices
28-22-00	FUEL SYSTEM - DEFUELING
28-27-00	FUEL SYSTEM - FUEL TRANSFER
33-17-00	Annunciator System - Adjustment and Test

C 3. Adjustment/Test

A. Preliminary Procedures

(1) Apply external electrical power (Ref. 24-00-00).

(2) On Flight Engineer/Second Officers aft circuit breaker panel CB3, Zone 215, verify that the following circuit breakers are closed:

FUEL SYSTEM - FUEL QTY IND (T1 through T5)

JTSN & DEFUEL - 2L & 2R (U2 or U3)

JTSN & DEFUEL - 1 & 3 (U11, U12)

JTSN ARM (U18)

R R R R R CAUTION: FUEL WILL BE JETTISONED OVERBOARD IF PRECAUTIONS ARE NOT TAKEN TO PREVENT FUEL BOOST PUMP OPERATION. OPEN AND TAG ALL ROW U INBOARD AND OUTBOARD BOOST PUMP CIRCUIT BREAKERS ON FE/SO CB3 CIRCUIT BREAKER PANEL.

Open and tag all inboard and outboard boost pump circuit breakers (U3 through U15).

On pilots overhead circuit breaker panel SB1, zone 210, verify that GRAVITY FEED VALVE - Tank 1A and Tank 3A (H14 and H15) circuit breakers are closed.

(3) The FE/SO panel indicator lights test (Ref. 33-17-00). Verify that indicator lamps on Fuel System and Fuel Jettison panel come on.

(4) Determine if fuel jettison stop sensors (thermistors) are uncovered or immersed in fuel. Jettison stop sensors are uncovered when tank fuel levels are below the following levels.

TANK 2L AND 2R - 3400 TO 4400 LBS (1540 TO 1995 KG)

TANK 1 AND 3 - 10,350 TO 12,350 LBS (4695 TO 5600 KG)

If fuel levels are within the ranges noted, transfer fuel into or out of the tank as necessary until there is no doubt whether the jettison stop thermistors are either completely submerged or exposed (Ref. 28-22-00).

(5) If jettison stop thermistors are exposed (not covered by fuel), proceed with Operational Test, paragraph B. If immersed in fuel, proceed with Operational Test, Paragraph C.

B. Operational Check (Tank Fuel Levels Below Jettison Stop Thermistor)

(1) Establish interphone communication between Flight Engineer/Second Officers station and assistant in MESC.

C (2) Verify that Steps 3A(1) through 3A(4) have been done.

(3) At the FUEL JETTISON panel, lift guard and depress (latch) MASTER switch. Verify the following results:

(a) OPEN light comes on.

(b) Fueling/defueling manifold isolation valve opens (blue light in MASTER switch comes on, then goes out).

(c) Left and right wing fuel jettison valves open (blue lights next to MASTER switch come on, then go out).

(d) On aircraft with wing center section tanks, tank 1A and 3A gravity transfer valves open (blue lights in GRAVITY TRANSFER - TANK 1A and 3A switches come on, then go out, and XFR lights come on).

NOTE: Depressing (latching) the jettison MASTER switch will also close both tank 1A and 3A fuel transfer valves, if open. This function is included in the tank 1A/3A fuel transfer operational check procedures (Ref. 28-27-00).

(4) Lift guards and depress (latch) 2L, 1, 3, and 2R DUMP switches. Verify the following results:

(a) DUMP light comes on.

(b) Defuel (fuel dump) valves remain closed (blue valve-in-transit lights remain out).

(5) In the MESC, hold the tank 2L signal conditioner BITE switch depressed. At the fuel jettison panel, verify that the tank 2L defuel valve opens (blue light in 2L DUMP switch on, then out).

NOTE: Holding the BITE switch depressed simulates an immersed fuel jettison sensor which will cause the defuel valve to open. The test verifies operation of the signal conditioner fuel jettison channel circuitry, defuel valve control relay, and defuel valve.

(6) With the BITE switch still held in, depress (unlatch) the 2L DUMP switch. Verify the following results:

(a) 2L DUMP light goes out.

(b) 2L defuel valve closed (blue valve-in-transit light on, then out).

(7) Release the tank 2L signal conditioner BITE switch and depress (latch) the 2L DUMP switch. Verify same result as in Step 4B(4).

(8) Repeat Steps 4B(5) through 4B(7) using the tank 1, 3, and 2R signal conditioner BITE switches and 1, 3, 2R DUMP switches.

(9) While assistant in MESC holds all four BITE switches depressed (all DUMP lights on and defuel valves open), depress (unlatch) jettison MASTER switch. Verify the following results:

(a) MASTER switch OPEN light goes out.

(b) Left and right wing fuel jettison valves close (blue lights next to MASTER switch on, then out).

(c) 2L, 1, 3, and 2R defuel valves close (blue DUMP switch lights on, then out).

(d) On aircraft with wing center section tanks, tank 1A and 3A gravity transfer valves close (blue lights in GRAVITY TRANSFER - TANK 1A and 3A switches on, then out, and XFR lights go out).

(10) Depress (unlatch) 2L, 1, 3, 2R DUMP switches. Verify that DUMP lights go out.

C (11) Close jettison panel switch guards.

CR (12) Remove tags and close boost pump circuit breakers opened in Step 3A(2).

C. Operational Check (Fuel Levels Above Jettison Stop Sensors)

NOTE: Refer to Paragraph 3B for verification of dump valve operation.

(1) Establish interphone interphone communication between Flight Engineer/Second Officers station and MESC.

(2) At the FUEL JETTISON panel, lift guard and depress (latch) MASTER switch. Verify the following results:

(a) OPEN light comes on.

(b) Fueling/defueling manifold isolation valve opens (blue valve-in-transit light on, then out).

(c) Left and right wing fuel jettison valves open (blue valve-in-transit lights each side of MASTER switch on, then out).

(d) On aircraft with wing center section tanks, tank 1A and 3A gravity transfer valves open (blue valve-in-transit light on, then out, and XFR lights on).

(3) Lift guards and depress (latch) 2L, 1, 3, and 2R DUMP switches. Verify the following:

(a) DUMP lights come on.

(b) Defuel (fuel dump) valves open (blue valve-in-transit lights on, then out).

(4) Depress (unlatch) MASTER switch. Verify the following results:

(a) MASTER switch OPEN light goes out.

(b) Left and right wing fuel jettison valves close (blue lights next to MASTER switch on, then out).

(c) 2L, 1, 3, and 2R defuel valves close (blue DUMP switch lights on, then out).

(5) Depress (unlatch) DUMP switches.

C (6) Close all switch guards.

(7) Remove tags and close boost pump circuit breakers
C opened in Step 3A(2).

D. Fuel Jettison BITE Check

NOTE: Refer to Paragraph 3B for verification of dump valve operation.

(1) Apply external aircraft power (Ref. 24-00-00).

(2) Verify that the following circuit breakers on Flight Engineer/Second Officers aft circuit breaker panel CB3, are closed:

FUEL SYSTEM - FUEL QTY IND (T1 through T5)

JTSN & DEFUEL - 2L & 2R (U2 or U3)

JTSN & DEFUEL - 1 & 3 (U11, U12)

(3) Verify that MASTER switch and fuel DUMP switches on FUEL JETTISON panel are out (unlatched) and that switch guards are down and safetied (MASTER switch OPEN light out; DUMP lights out).

(4) In the MESC, simultaneously depress the BITE switch and JTSN (JETTISON) push-to-test lights on each signal conditioner. Verify that the green JTSN (JETTISON) light comes on.

NOTE: This test inserts a simulated wet jettison stop thermistor input signal in the signal conditioner fuel jettison control circuitry and verifies operational status of the signal conditioner.

There will be a 3.0 (±2.0) second delay before a tank 2L and 2R jettison lights comes on.

(5) On each signal conditioner, depress only the JTSN (JETTISON) push-to-test switch. If the jettison stop thermistor is immersed in fuel, the green light should come on.

NOTE: The above test is a valid check of the thermistor and wiring to the signal conditioner only if the thermistor is known to be submerged in fuel.

FUEL JETTISON VALVE - MAINTENANCE PRACTICES

1. General

The following procedure specifies the method used to deactivate an inoperative fuel jettison valve.

2. Deactivation

R NOTE: This deactivation procedure applies only when an aircraft
R is to be dispatched in accordance with the MEL.

A. Fuel Jettison Valve

(1) On Flight Engineer/Second Officers FUEL JETTISON panel, zone 215, verify that defuel valve DUMP and JETTISON valve master switchlights are in off position.

(2) Gain access to fuel jettison valve by opening wing access doors 5718B or 6718B.

(3) Disconnect and stow electrical connector at deactivated valve.

(4) Verify that deactivated valve is in closed position. If necessary operate actuator override lever to CLOSED position.

(5) Close access panels.

(6) Install tag in flight station at a location clearly visible to flight crew.

(7) Make appropriate entry in aircraft log book.

FUEL JETTISON VALVE - REMOVAL AND INSTALLATION

1. Equipment and Materials

   Lock-wire, Fed Spec QQ-W-390, 0.032-in. diameter, or equivalent

R O-rings (Ref. Fig. 401)

C Grease, Fluorosilicone, Dow Corning FS 1291, or equivalent

2. Referenced Procedures

6-40-00	Exterior Access Doors and Panels
24-41-00	External Power/Ground Service System - Maintenance Practices
28-20-01	Wig-O-Flex Coupling - Maintenance Practices
28-31-02	Jettison Valve Actuator - Removal and Installation

3. Removal/Installation

   A. Removal

      (1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag circuit breakers JTSN & DEFUEL - 2L 2R, JTSN & DEFUEL - 1 and 3, JTSN ARM and all boost pump circuit breakers (U1 through 18).

      (2) On Flight Engineer/Second Officers FUEL JETTISON panel, zone 215, verify that DUMP and jettison valve MASTER switchlights are off and guarded.

R CAUTION: ATTACH MAINTENANCE-IN-PROGRESS TAG TO FUEL SYSTEM PANEL.

      (3) Open access door 571AB or 671AB (Ref. 6-40-00).

      (4) Remove access cover 571BB or 671BB (Ref. 6-40-00).

      (5) Disconnect electrical harness at fuel jettison valve actuator.

      (6) Verify that override lever on actuator is in the CLOSED position.

      (7) Remove actuator (Ref. 28-31-02).

(8) Dissasemble Wig-O-Flex coupling installed in jettison mast approximately 24 inches aft of jettison valve (Ref. 28-20-01).

(9) Loosen jettison mast support clamp.

R R (10) Loosen and back off forward Wig-O-Flex coupling nut at jettison valve (Ref. 28-20-01).

R R R (11) Rotate and move jettison mast aft to disengage Wig-O-Flex reducer body from jettison valve coupling adapter.

R (12) Remove 6 jettison valve flange attach bolts.

R R (13) Disengage jettison valve from connector that protrudes through wing beam.

(14) Remove two split-washers, O-ring, and coupling nut from coupling adapter.

B. Installation

(1) Verify that circuit breakers opened in Step 3A(1) are open and tagged.

(2) On FUEL JETTISON panel, zone 215, verify that defuel valve DUMP and jettison valve MASTER switchlights are off and guarded.

(3) Lubricate new O-ring with specified grease and install on connector at wing beam (Ref. Fig. 401).

(4) Lubricate new O-ring and install in new jettison valve mounting flange.

NOTE: Verify that new valve is in closed position. If open, rotate valve shaft to close valve.

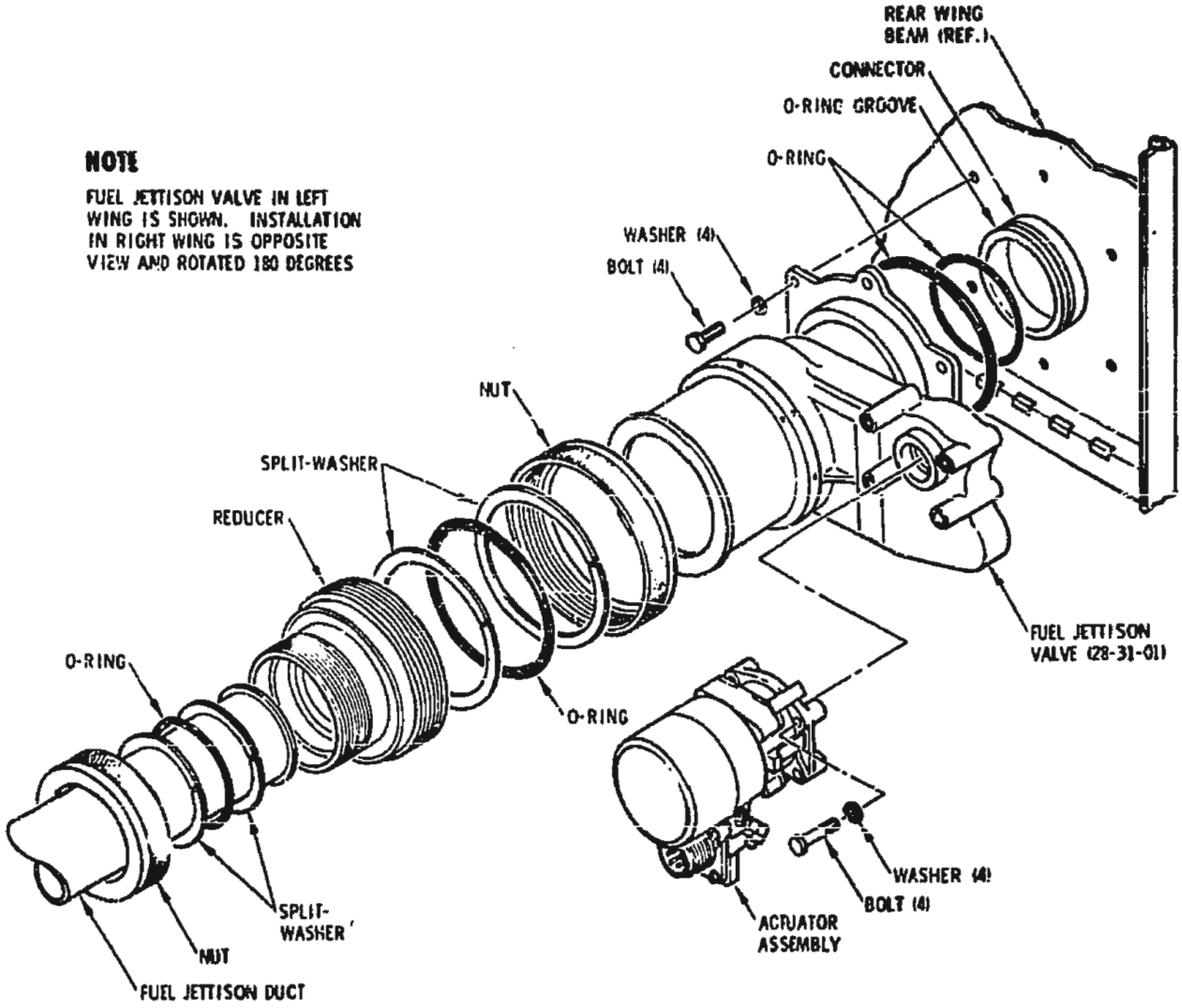
(5) Mount valve in installed position and install 6 attach bolts.

(6) Install Wig-O-Flex coupling nut on jettison valve coupling adapter (Ref. 28-20-01).

(7) Install split-washer, lubricated O-ring, and second split-washer (in that order).

(8) Engage Wig-O-Flex reducer body with jettison valve coupling adapter. Rotate jettison mast to align with coupling at opposite end of removed section. Install

R new lubricated O-rings and assemble Wig-O-Flex



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R Fuel Jettison Valve - Removal and Installation
R Figure 401

EFFECTIVITY: ALL

050B

couplings. Hand tighten coupling nuts until firmly seated (Ref. 28-20-01).

(9) Tighten support clamp fasteners.

(10) Verify override lever is in closed position.

(11) Install valve actuator (Ref. 28-31-02).

(12) Attach electrical connector.

(13) Install lock-wire on electrical connector and Wig-O-Flex couplings.

(14) Turn on electrical power (Ref. 24-41-00).

(15) Remove tags and close circuit breakers opened in Step 3A(1).

(16) On FUEL JETTISON panel, zone 215, depress and latch MASTER switchlight. Verify that OPEN light comes on and in-transit lights on each side of switchlight come on then go out. At replaced jettison valve, verify that valve has operated to open position.

(17) Depress and unlatch MASTER switchlight. Verify that in-transit lights come on and then go out as in preceding step. Verify that MASTER switchlight OPEN light goes out. At replaced jettison valve, verify that valve has closed.

(18) At fueling/defueling panel, zone 621, turn on SYSTEM POWER switch and open a defuel valve on side of airplane having replaced jettison valve.

CR
CR CAUTION: IF BOOST PUMP CIRCUIT BREAKER TRIPS, DO NOT RESET UNTIL IT IS VERIFIED THAT CIRCUIT BREAKER TRIP IS NOT CAUSED BY MALFUNCTION IN BOOST PUMP ASSEMBLY.

(19) Turn on boost pump in corresponding fuel tank and pressurize fueling/defueling manifold. Check for fuel leakage at replaced valve.

(20) Turn off boost pump.

(21) Close defuel valve and turn off fueling/defueling panel power.

(22) Turn off electrical power (Ref. 24-41-00).

(23) Reinstall access panel and close access door removed or opened in Step 3A(3) and (4).

(24) Verify that jettison valve MASTER switchlight is in off (unlatched) position. Close switchlight guard. (25) Remove MAINTENANCE-IN-PROGRESS tag from FUEL SYSTEM panel.

FUEL JETTISON VALVE ACTUATOR - REMOVAL AND INSTALLATION

1. Equipment and Materials

Lock-wire, Fed Spec QQ-W-390, 0.032-in diameter, or equivalent

2. Referenced Procedures

6-40-00	Exterior Access Doors and Panels
24-41-00	External Power/Ground Service System - Maintenance Practices

3. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag circuit breakers FUEL SYSTEM - JTSN & DEFUEL - 2L & 2R, JTSN & DEFUEL - 1 and 3, and JTSN ARM (U2 through U18 as noted).

(2) On Flight Engineer/Second Officers FUEL JETTISON panel, zone 215, verify that defuel valve dump and jettison valve MASTER switchlights are off and guarded.

(3) Open access door 571BB or 671BB at outer wing station 344.5 (Ref. 6-40-00).

(4) Disconnect electrical harness at fuel jettison valve actuator.

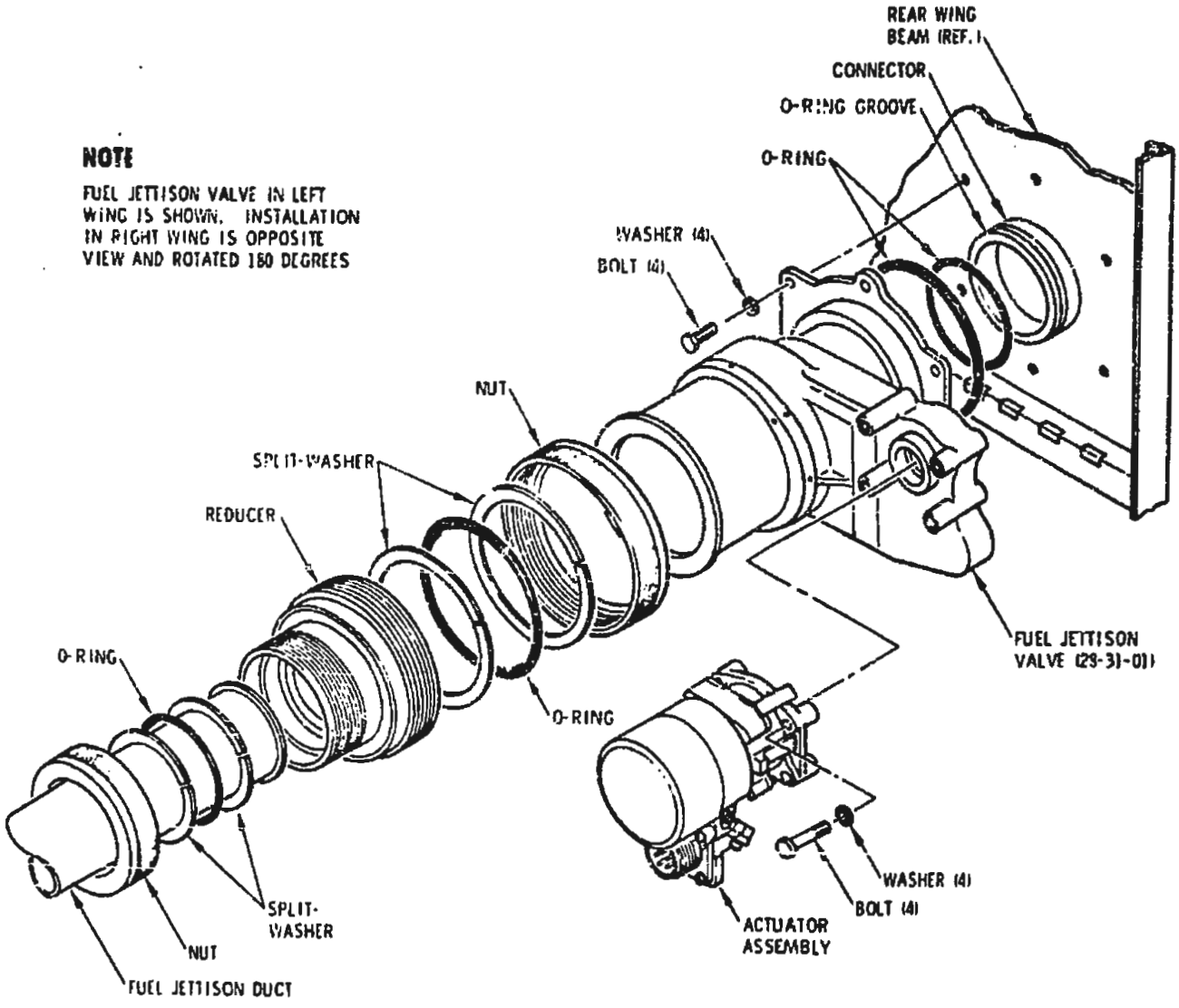
(5) Remove actuator attach screws and washers (Ref. Fig. 401).

(6) Disengage actuator output shaft from valve drive shaft to remove actuator.

B. Installation

(1) Verify that circuit breakers opened in Step 3A(1) are open and tagged.

(2) On FUEL JETTISON panel, zone 215, verify that defuel valve DUMP and jettison valve MASTER switchlights are off and guarded.



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R Fuel Jettison Valve Actuator - Removal and Installation
R Figure 401

EFFECTIVITY: ALL

050B

(3) Engage actuator output shaft to valve drive shaft (Ref. Fig. 401) with electrical connector at 6 o'clock position (left wing), 12 o'clock position (right wing).

NOTE: Actuator output shaft and valve drive shaft will not mate unless both are in closed or open position.

(4) Install actuator attach washers and screws.

(5) Attach electrical connector to actuator and install lock-wire.

(6) Turn on electrical power (Ref. 24-41-00).

(7) Remove tags and close circuit breakers opened in Step 3A(1).

(8) On FUEL JETTISON panel, verify that defuel valve DUMP switchlights are off and guarded.

(9) On FUEL SYSTEM panel, verify that fuel tank boost pump switches are off.

(10) On FUEL JETTISON panel, zone 215, depress and latch MASTER switchlight. Verify that OPEN light comes on and in-transit lights on each side of switchlight come on and then go out. At the replaced jettison valve, verify that the valve has operated to the open position.

(11) Depress and unlatch MASTER switchlight. Verify that in-transit lights come on and then go out as in preceding step. Verify that MASTER switchlight OPEN light goes out. At the replaced jettison valve, verify that the valve has closed.

(12) Turn off electrical power (Ref. 24-41-00).

(13) Close access door opened in Step 3A(3).

CR (14) Verify that jettison valve MASTER switchlight is in off (extended) position. Close switchlight guard.

FUEL JETTISON PANEL - MAINTENANCE PRACTICES

CR 1. Referenced Procedure

20-33-01 Switchlight (square) - Removal and Installation

24-41-00 External Power/Ground Service System - Maintenance Practices

CR 2. Maintenance Practices

A. Relamping Switchlights

(1) On the Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag the following circuit breakers on row U:

JTSN & DEFUEL 2L & 2R

OUTBD BOOST PUMP - 2L and 2R

INBD BOOST PUMP - TANK 1, 2L, 2R and 3

JTSN & DEFUEL - 1 and 3

OUTBD BOOST PUMP - 1 and 3

JTSN ARM

CR (2) Raise switchlight guard. (3) Grasp lens assembly by finger indentations and pull out (Ref. 20-33-01). Allow lens assembly to hang by retainer.

(4) Remove defective lamp.

(5) Install replacement lamp.

(6) Insert lens assembly into switchlight housing with the placard TOP facing up.

(7) Turn on electrical power (Ref. 24-41-00).

(8) On Flight Engineer/Second Officers LIGHTS panel, zone 215, depress WARNING/CAUTION/ADVISORY - TEST switchlight. Verify that replaced lamp comes on.

(9) Verify that switchlight is in OFF (unlatched) position.

(10) Close switchlight guard.

CR (11) Remove tags and close circuit breakers opened in Step
CR 3A(1).

FUEL JETTISON PANEL - REMOVAL AND INSTALLATION

1. Referenced Procedure

   28-31-00 Jettison System - Adjustment and Test

2. Removal/Installation

   A. Removal

      (1) On the Flight Engineer/Second Officers (FE/SO) aft circuit breaker panel CB3, zone 215, open and tag the following circuit breakers:

          JTSN & DEFUEL 2L & 2R (U2 or U3)

          OUTBD BOOST PUMP - 2L and 2R (U3 and U4) or (U5 and U6)

          INBD BOOST PUMP - TANK 1, 2L, 2R and 3 (U7 through U10)

          JTSN & DEFUEL - 1 and 3 (U11 and U12)

          OUTBD BOOST PUMP - 1 and 3 (U13 and U14)

          JTSN ARM (U18)

      (2) On FE/SO lower instrument panel unloosen four captive fasteners and pull FUEL JETTISON panel out of the FE/SO lower instrument panel (Ref. Fig. 401).

      (3) Disconnect electrical connectors 2800-P4 and P8.

   B. Installation

      (1) Verify that circuit breakers listed in Step 2A(1) are open and tagged.

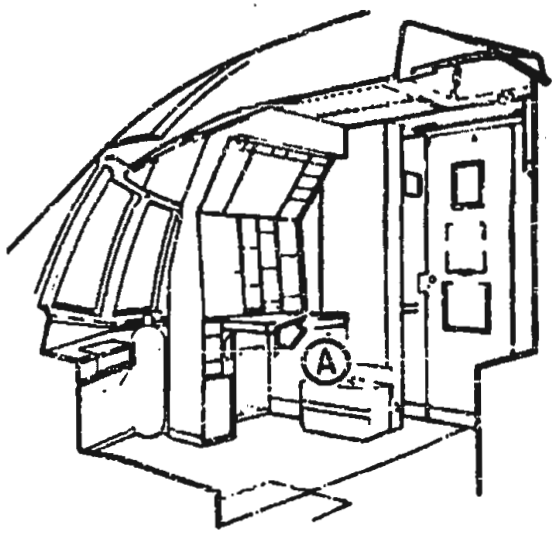
      (2) Reassemble electrical connectors 2800-P4 and P8 (Ref. Fig. 401).

      (3) Insert panel into the FE/SO lower instrument panel and secure four captive fasteners.

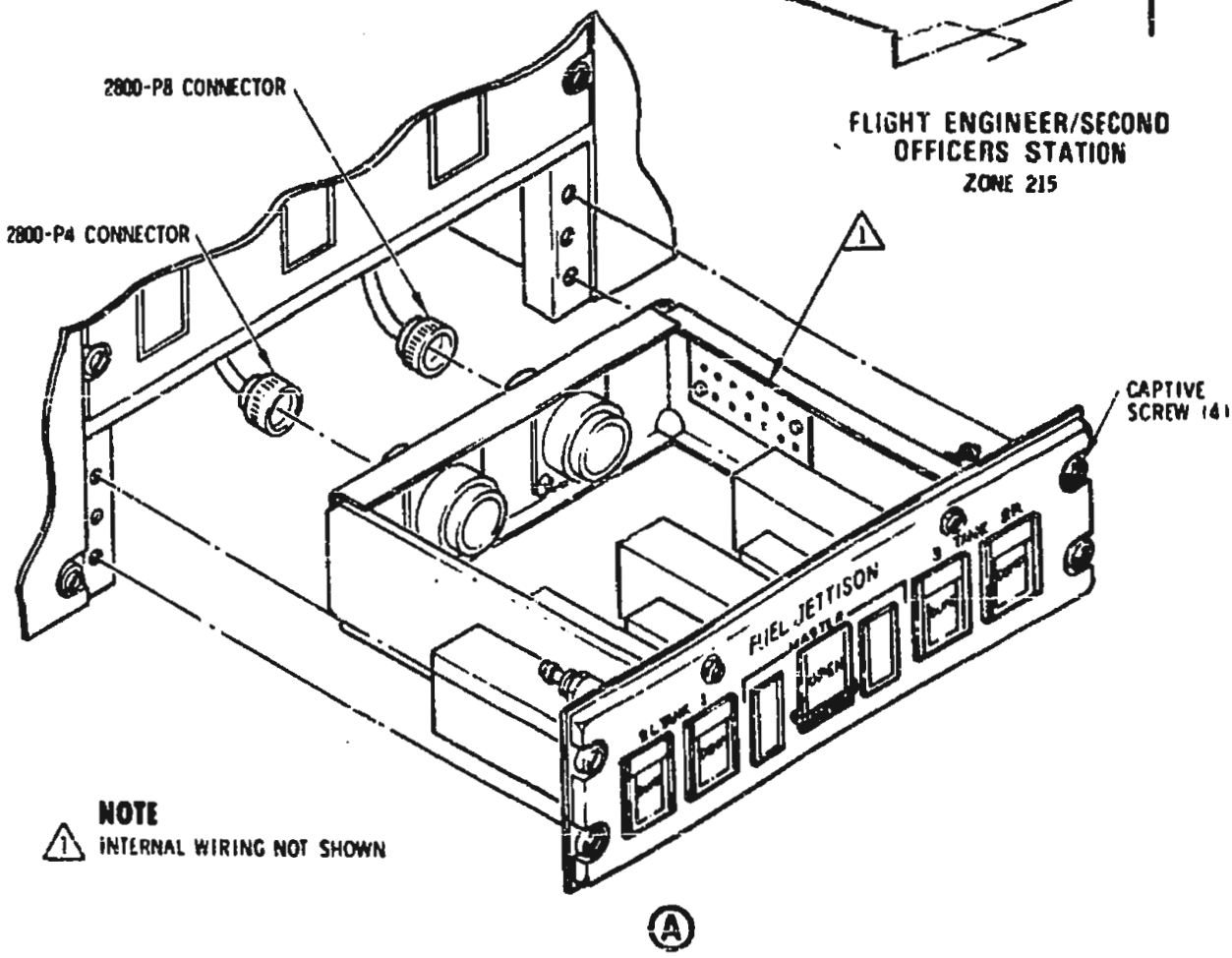
      (4) Verify that all switchlights on FUEL JETTISON panel are released.

R (5) Remove tags and close circuit breakers opened in Step
R 2A(1).

R (6) Perform Fuel Jettison System adjustment and test (Ref.
R 28-31-00).



FLIGHT ENGINEER/SECOND OFFICERS STATION
ZONE 215



NOTE
1 INTERNAL WIRING NOT SHOWN

M1-0001-28-400

R Fuel Jettison Panel - Removal and Installation
R Figure 401

R EFFECTIVITY: ALL
R
001B

INDICATING SYSTEMS - DESCRIPTION AND OPERATION

1. General

Fuel system status is indicated on the Flight Engineer/Second Officers FUEL SYSTEM panel, zone 215, by the following components:

Four primary fuel quantity indicators (Ref. 28-41-00)

A fuel totalizer indicator having aircraft gross weight monitoring provisions (Ref. 28-41-00)

A FUEL QUANTITY test switch for testing the signal conditioners and indicators (Ref. 28-41-00)

Tank 2L and 2R inboard section fuel quantity select switches having low fuel quantity advisory lights (Ref. 28-41-00)

R On aircraft 025-026, 028-999, tank 1A and 3A fuel quantity select switches having low fuel quantity advisory lights (Ref. 28-41-00), and tank 1A and 3A fuel transfer select switches.

Tank 1A and 3A gravity transfer select switches on aircraft with center section tanks (Ref. 28-27-00).

Crossfeed valve select switches (Ref. 28-26-00)

Boost pump control switches having low pressure advisory lights (Ref. 28-24-00)

R Engine feed tank valve control switches (Ref. 28-24-00)

APU emergency shutoff valve position indicating lights (Ref. 28-25-00)

Engine firewall shutoff valve position lights (Ref. 28-24-00)

Refuel power on indicating and override switchlight (Ref. 28-41-00)

Engine fuel pressure warning lights (Ref. 73-31-00)

Fueling/defueling panel power override switch.

Fuel used reset control switchlight (Ref. 73-34-00)

Fuel temperature gage and selector switch (Ref. 73-37-00)

A thermal overload or open fault in one or more legs of a boost pump three-phase winding is indicated by illumination of a LOW legend in the boost pump switch lens.

A FUEL JETTISON panel located next to the FUEL SYSTEM panel equipped with a master fuel jettison control switchlight, four defuel valve control switchlights, and two jettison valve position cycling lights.

Additional fuel system status components are installed on the fueling/defueling panel for use by maintenance and servicing personnel (Ref. 28-41-00). These components consist of four fuel quantity indicators, valve open or closed lights for the fueling, defueling and manifold isolation valves, SET POINT TEST lights that operate in conjunction with each indicator SET knob to indicate automatic termination of fueling at the fuel level selected by the SET knob and a fuel quantity indicator test switch.

On aircraft 001-024 and 027,
in the mid electrical service center, tank No. 1 and 3 fuel quantity system signal conditioners are equipped with SYSTEM and BITE test switches and fuel JETTISON push-to-test light switches. Tank No. 2L and 2R signal conditioners have BITE test switches and fuel fuel JETTISON and SUMP push-to-test light switches.

R On aircraft 025-026, 028-999,
in the mid electrical service center, tank 1/1A and tank 3/3A fuel quantity system signal conditioners are equipped with BITE and SYSTEM test and fuel jettison, fuel transfer (scavenge) control, and low fuel level push-to-test light switches. Tank 2L and 2R signal conditioners have BITE switches and fuel jettison and low fuel level (sump) push-to-test light switches.

The SYSTEM switches check the fuel quantity indicators in the same manner as the QUANTITY TEST switch on the flight station panel. The BITE switch checks the appropriate signal conditioner thermister circuits. Push-to-test light switches, when pressed singly and in conjunction with the BITE switches, provide a means of testing the low fuel quantity indicating, fuel transfer control, and fuel jettison control circuit channels in the signal conditioners and fuel level sensing signal input circuitry.

FUEL QUANTITY INDICATING SYSTEM - DESCRIPTION AND OPERATION

1. General

A. System Description

Fuel quantity is displayed on both the Flight Engineer/Second Officers (FE/SO) FUEL SYSTEM panel, zone 215, and fueling/defueling panel located in the right wing leading edge section, zone 621 (Ref. Fig. 1).

One fuel quantity indicator for each tank and a quantity totalizer, reading in pounds of fuel, is located on the FE/SO FUEL SYSTEM panel. Fuel quantity indicators display both digital (counter) and analog (pointer) readouts. The totalizer shows digital readouts of total fuel quantity and aircraft gross weight.

The fueling/defueling panel supports a fuel quantity indicator for each tank. Set knobs on each of these indicators preset the amount of fuel to be contained in each tank. Circuitry in the indicator automatically terminates refueling at preset fuel quantity.

R Fuel level sight gage assemblies containing calibrated fuel level measuring sticks, accessible from underwing and fuselage keelson area fairings, provide a mechanical method of determining the amount of fuel in each of the wing and center section tanks. Fuel quantity is indicated by the length of stick extension below wing surface and fuselage fairing, when unlocked and magnetically latched to a float in the tank.

Fifteen full height compensated capacitance type fuel quantity transmitter probes, numbered 1 through 15, are installed in each wing; 9 in each of the 2L and 2R tanks and 6 in each of the 1 and 3 tanks.

On aircraft 025, 026, 028-999, one fuel quantity transmitter probe is installed internally in each 1A and 3A center section tank. These probes are designated as probe numbers 16 and 17. Thermistor type fuel level sensors attached to probes 3, 9, 13 and 16 provide low fuel level signals to signal conditioners in the MESC area.

Four signal conditioners, one for each tank, convert total probe capacitance parameters to a proportional fuel quantity input signal which is applied to the flight station and fueling/defueling panel indicators. Fuel level thermistor signals are converted to the voltages required to control fuel

jettison shutoff (defuel) valves, and low fuel level indication lights on the flight station fuel system panel.

Signal conditioners and fuel quantity indicators are bench adjusted to provide zero fuel (empty tank) indications for a predetermined dry fuel probe and harness loop input signal capacitance. Calibration on the aircraft is then limited to adjustment of a probe trimming capacitance in a variable capacitor trimmer unit (VCTU) located next to the signal conditioners to produce a corresponding zero fuel quantity indication on the appropriate flight station fuel quantity indicator.

A QUANTITY TEST switch on the Flight Engineer/Second Officers FUEL SYSTEM panel, a GAUGES TEST switch on the right wing fueling/defueling panel, and SYS TEST switches on tank 1/1A and 3/3A signal conditioners in the MESC, provide a means of operationally checking the fuel quantity system. All four switches are electrically in parallel and will produce identical system response. When either switch is closed, a simulated full tank signal is internally applied to each signal conditioner fuel quantity measurement channel. Test results are indicated by all fuel quantity indicators, including the totalizer, driving upscale to full tank indications.

Built-in test (BITE) provisions incorporated on the signal conditioner units enable onboard checking of component operation and isolation of malfunctioning units.

R On aircraft 025, 026, 028-999,
BITE provisions include pushbutton BITE switches on each signal conditioner, push-to-test JTSN, SCAV, and LL (low level) test light switches on the tank 1/1A and 3/3A signal conditioners, and push-to-test JETTISON and SUMP light switches on the tank 2L and 2R signal conditioners. The above Push-To-Test switches when used in conjunction with the BITE switches and tank 1/1A and 3/3A signal conditioner SYS TEST switches provide a means of separately checking those portions of the fuel level sensing thermistor circuitry located within and external to the signal conditioners. Analysis of the light indications will isolate a fault to a signal conditioner or respective tank thermistor circuit.

B. System Operation

The fuel quantity indicating system provides a continuous digital and analog display of the amount of fuel in each tank. Fuel quantity is sensed by capacitance-type transmitter probes in each tank. Total probe capacitance is applied to the corresponding tank signal conditioner where it is converted to a proportional dc voltage representing fuel quantity. This voltage is then applied as an input

R signal to the appropriate flight station and
R fueling/defueling panel indicators. A totalizer indicator sums the signal to each indicator and displays total weight of fuel on the aircraft.

3. Fuel Quantity Indicators (FE/SO Fuel System Panel)

A. Description

Four fuel quantity indicators are located on the upper section of the Flight Engineers/Second Officers FUEL SYSTEM control panel, zone 215.

Each indicator is housed in a standard No. 2 ATI case, and consists of a mechanical assembly and an electronic assembly. The mechanical assembly consists of a dial, end-plate and lighting board subassembly, feedback potentiometer, stepper motor, and geartrain.

The electronic component assembly includes a power supply, up-down counter, stepper motor logic, and a detection circuit. The end-plate assembly includes two calibration potentiometers and an electrical connector. Front mounted, replaceable lamps illuminate the dial.

B. Operation

Each indicator receives a dc voltage input (Ref. Fig. 2 and 3) representing the amount of fuel in the respective fuel tank and compares it to the existing readout voltage from the feedback potentiometer. When the two inputs represent the same fuel quantity, the circuit remains in a stable state. When there is a difference between the two signals, an unbalance signal is generated by a dc comparator and applied to polarity detectors. The polarity of the unbalance signal is detected, and a signal of the correct polarity is then applied to the up-down counter. The up-down counter circuit provides coded pulses to the stepper motor logic circuit to drive the stepper motor in the correct direction. The stepper motor, driving through a small-ratio gear train, repositions the indicator pointer and the feedback potentiometer cancelling the unbalance signal and returning the circuit to a stable state. The power supply provides operating voltages for the using circuit.

Operating power for the indicators is 115V, 400Hz. Indicator lighting operates on 5V, 400-Hz power.

R 4. Fuel Quantity Indicators (Fueling/Defueling Panel)

R A. Description

R Four fuel quantity indicators are located on the
R fueling/defueling panel, zone 621. These indicators display
R the mass of fuel available in the individual tanks. Each
R indicator provides a digital (counter) and an analog
R (pointer) display. A separate pointer, or bug, on the front
R face of each indicator, indicates the amount of fuel to be
R contained in the corresponding fuel tank (Ref. Fig. 1 and
R 4). The indicator consists of a metal housing, set knob,
R indicator bezel, dial window, indicator subassembly,
R mechanical assembly, electrical assembly and a protective
R plate assembly.

R B. Operation

R The indicator displays the amount of fuel in its respective
R tank and provides an automatic shut-off for fueling
R operations. A comparator circuit in the indicator receives
R a dc input representing actual fuel quantity acn compares it
R with an input representing the existing quantity reading.
R When the two inputs represent the same fuel quantity, the
R circuit remains in a quiescent state. When there is a
R difference in the two signal inputs, an unbalance signal is
R generated by the dc comparator and applied to two polarity
R detectors. The polarity of the unbalanced signal is
R detected and a corrective input is applied to the up-down
R counter. The up-down counter circuit provides coded pulses
R to the stepper motor logic circuit to drive the stepper
R motor in the correct direction. The stepper motor, driving
R through a small ratio gear train, repositions the indicator,
R cancelling the unbalance signal and returning the circuit to
R a quiescent state.

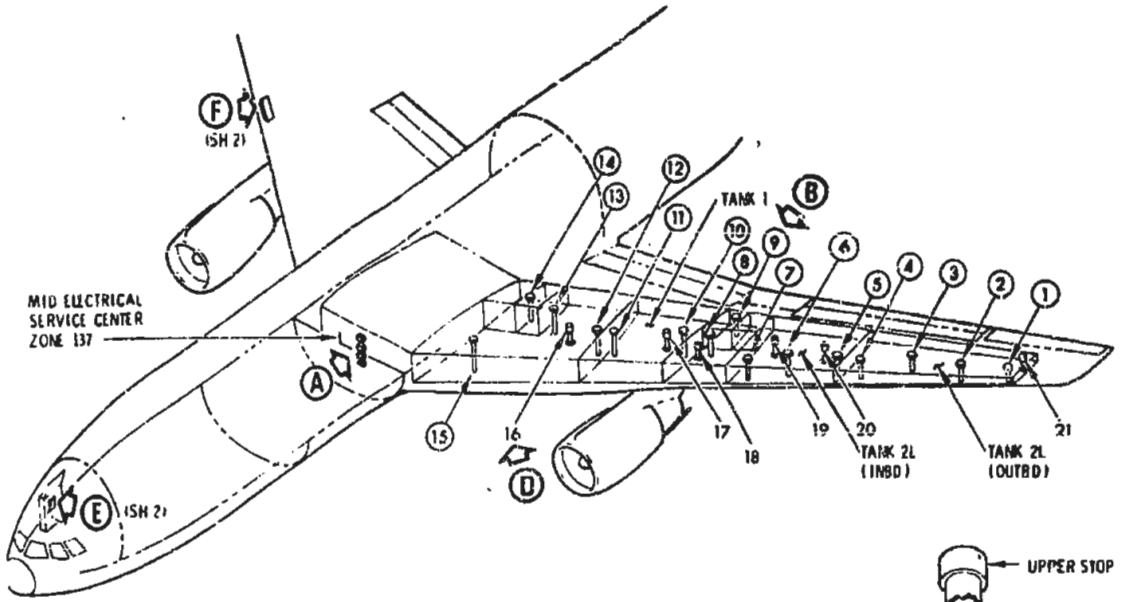
R Provisions are incorporated in each indicator to control the
R amount of fuel loaded in the tank monitored by the
R respective indicator.

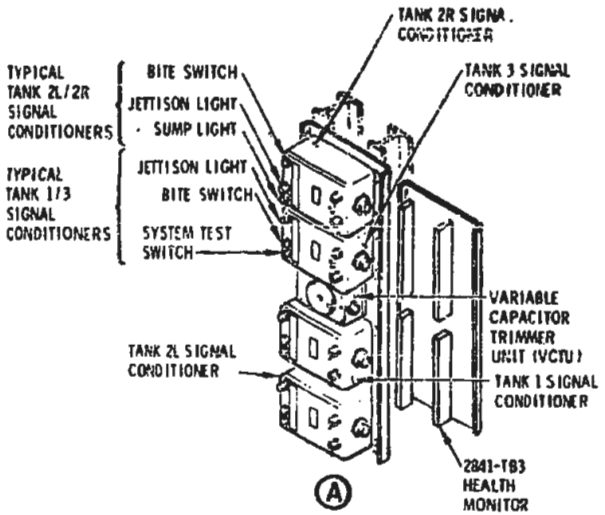
R 5. Totalizer Indicator

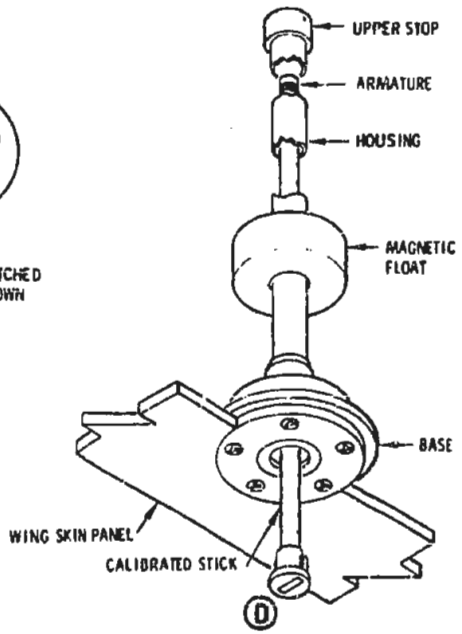
R A. Description

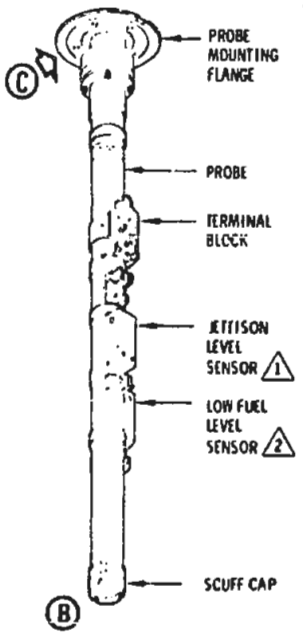
R The fuel quantity totalizer indicator (Ref. Fig. 4) located
R on the FE/SO FUEL SYSTEM panel provides a dual counter
R digital display of total fuel quantity by weight and
R aircraft gross weight. The gross weight of the aircraft,
R without fuel, is placed into the counter with the set knob.

R B. Operation









(1) THRU (15) FUEL QUANTITY TRANSMITTER PROBES
16 FUEL LEVEL SIGHT GAGE (NO. 1 INNER STICK)
17 FUEL LEVEL SIGHT GAGE (NO. 1 OUTER STICK)
18 FUEL LEVEL SIGHT GAGE (NO. 2L INNER STICK)
19 FUEL LEVEL SIGHT GAGE (NO. 2L MIDDLE STICK)
20 FUEL LEVEL SIGHT GAGE (NO. 2L OUTER STICK)
21 FUEL LEVEL SIGHT GAGE (NO. 2L OUTBD COMPT STICK)

NOTE

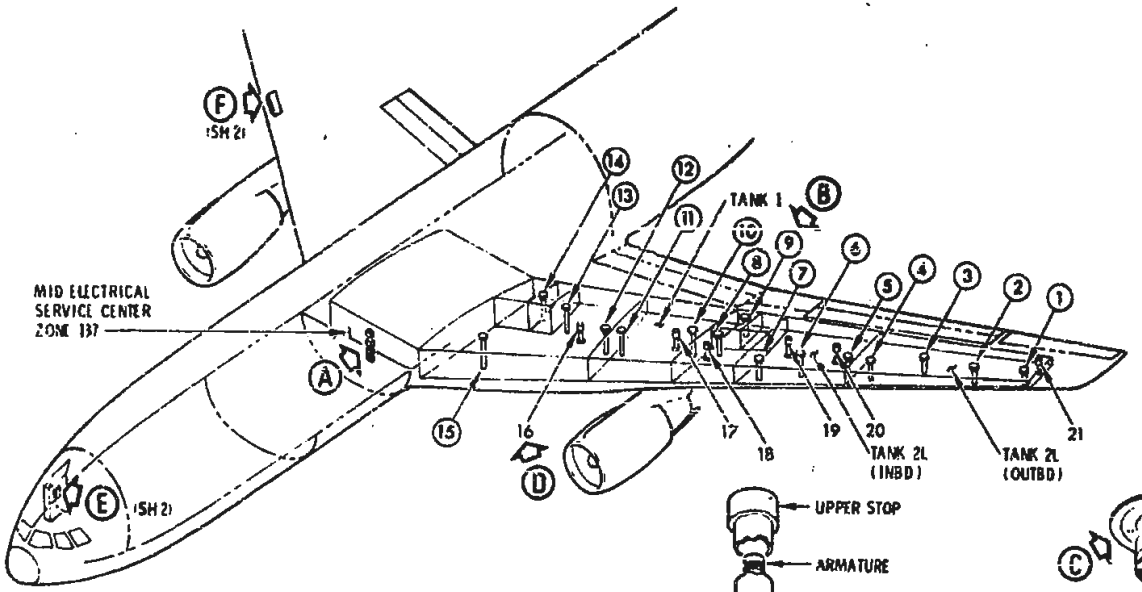
(1) JETTISON LEVEL SENSORS ARE INSTALLED ON PROBES NO. 3, 9, AND 13 ONLY

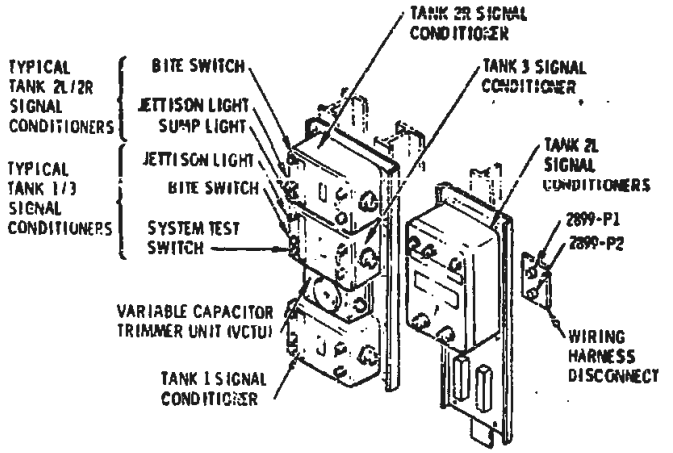
(2) FUEL LOW-LEVEL SENSOR IS INSTALLED ON PROBE NO. 9 ONLY

3 LEFT WING SHOWN, RIGHT WING OPPOSITE

M1-0002-28-375

R Fuel Quantity Indicating System Components
R Figure 1 (Sheet 1)





(A) SIGNAL CONDITIONERS AND VARIABLE CAPACITOR TRIMMER UNIT (VCTU)

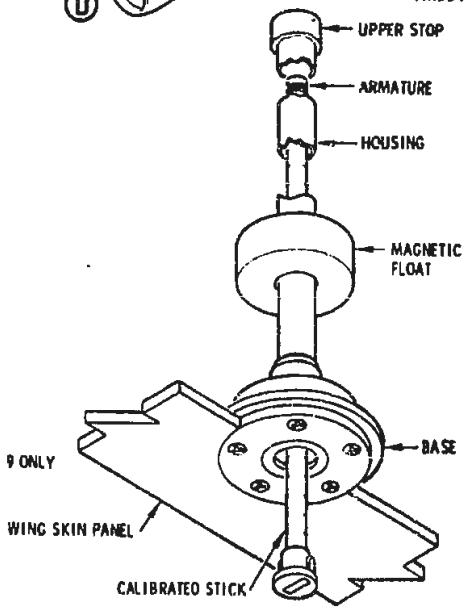
(1) THRU (15) FUEL QTY TRANSMITTER PROBES
16 FUEL LEVEL SIGHT GAGE (NO. 1 INNER STICK)
17 FUEL LEVEL SIGHT GAGE (NO. 1 OUTER STICK)
18 FUEL LEVEL SIGHT GAGE (NO. 2L INNER STICK)
19 FUEL LEVEL SIGHT GAGE (NO. 2L MIDDLE STICK)
20 FUEL LEVEL SIGHT GAGE (NO. 2L OUTER STICK)
21 FUEL LEVEL SIGHT GAGE (NO. 2L OUTBD COMPT STICK)

NOTE

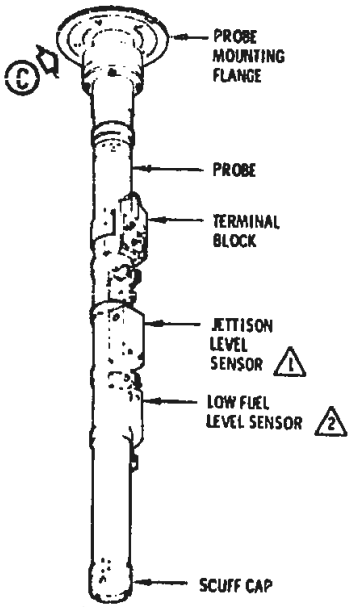
(1) JETTISON LEVEL SENSORS ARE INSTALLED ON PROBES NO. 3, 9, AND 13 ONLY

(2) FUEL LOW-LEVEL SENSOR IS INSTALLED ON PROBE NO. 9 ONLY

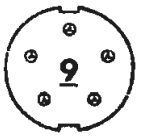
3 LEFT WING SHOWN, RIGHT WING OPPOSITE



FUEL QTY SIGHT GAGE
(D)



FUEL QTY TRANSMITTER PROBE
(B)

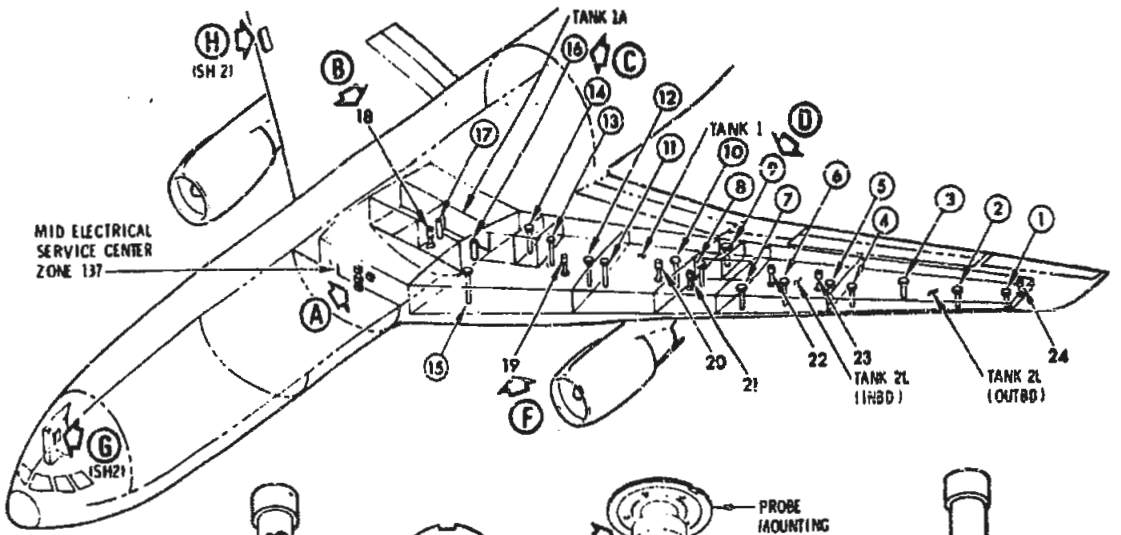


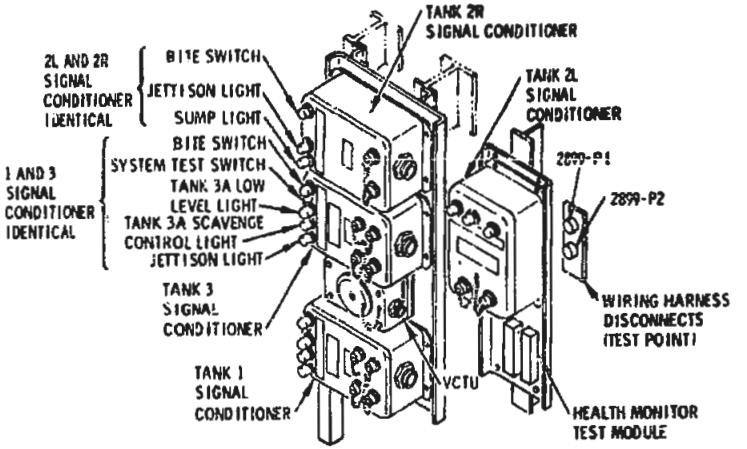
(C) PROBE NUMBERS ETCHED ON PROBE AS SHOWN

MI-0002-28-374

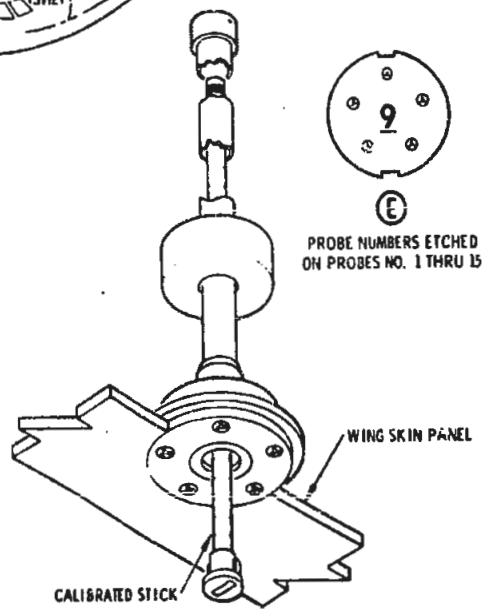
R Fuel Quantity Indicating System Components
R Figure 1 (Sheet 1)

EFFECTIVITY: 024, 027



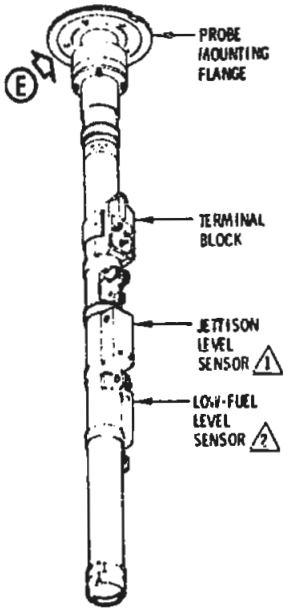


A
SIGNAL CONDITIONERS

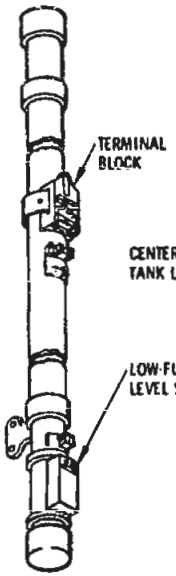


F
WING TANK SIGHT GAGE

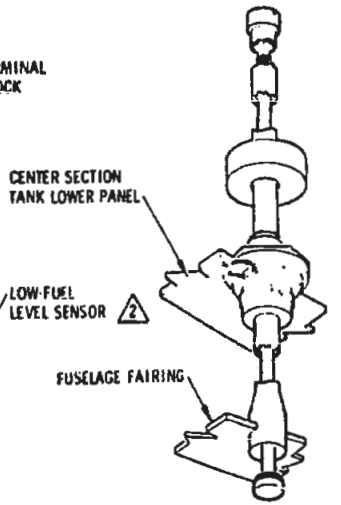
E
PROBE NUMBERS ETCHED ON PROBES NO. 1 THRU 15



D
WING TANK PROBE



C
TANK 1A/3A FUEL QUANTITY PROBE



B
TANK 1A/3A SIGHT GAGE

(1) THRU (15) WING TANK FUEL QUANTITY TRANSMITTER PROBES
(16) THRU (17) CENTER SECTION TANK FUEL QUANTITY TRANSMITTER PROBES
18 FUEL LEVEL SIGHT GAGE (NO. 1A STICK)
19 FUEL LEVEL SIGHT GAGE (NO. 1 INNER STICK)
20 FUEL LEVEL SIGHT GAGE (NO. 1 OUTER STICK)
21 FUEL LEVEL SIGHT GAGE (NO. 2L INNER STICK)
22 FUEL LEVEL SIGHT GAGE (NO. 2L MIDDLE STICK)
23 FUEL LEVEL SIGHT GAGE (NO. 2L OUTER STICK)
24 FUEL LEVEL SIGHT GAGE (NO. 2L OUTBD COMPT STICK)

NOTE

1 JETTISON LEVEL SENSORS ARE INSTALLED ON PROBE NO. 3, 9, AND 13 ONLY

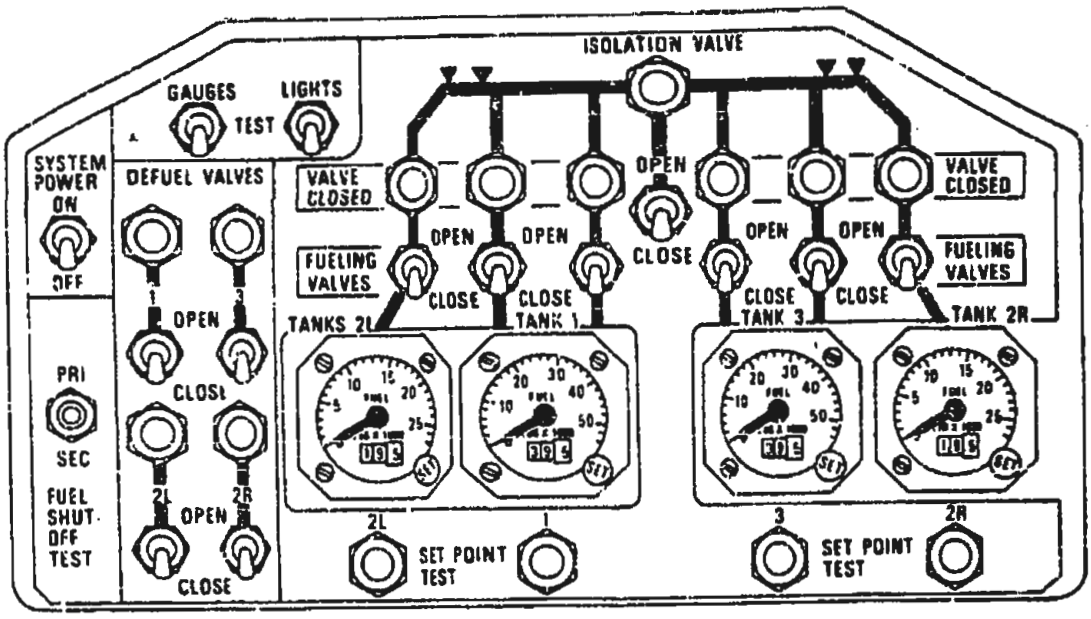
2 FUEL LOW-LEVEL SENSORS ARE INSTALLED ON PROBE NO. 9 AND 16

3 LEFT WING SHOWN, RIGHT WING OPPOSITE

M1-0003-28-1020

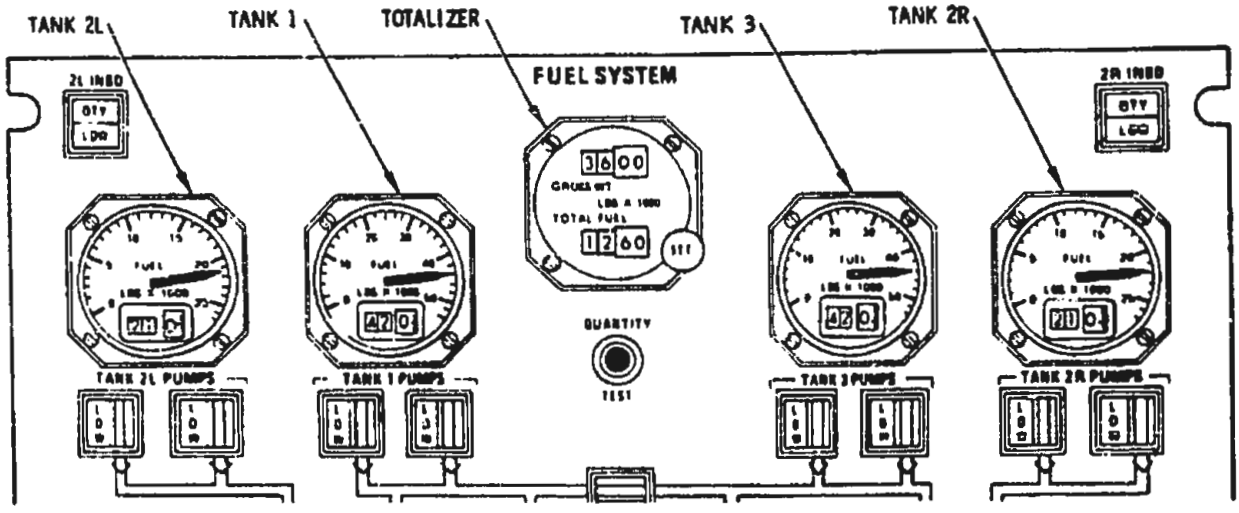
R Fuel Quantity Indicating System Components
R Figure 1 (Sheet 1)

EFFECTIVITY: 025, 026, 028-999



FUELING/DEFUELING PANEL

(F)



FE/SO FUEL SYSTEM PANEL

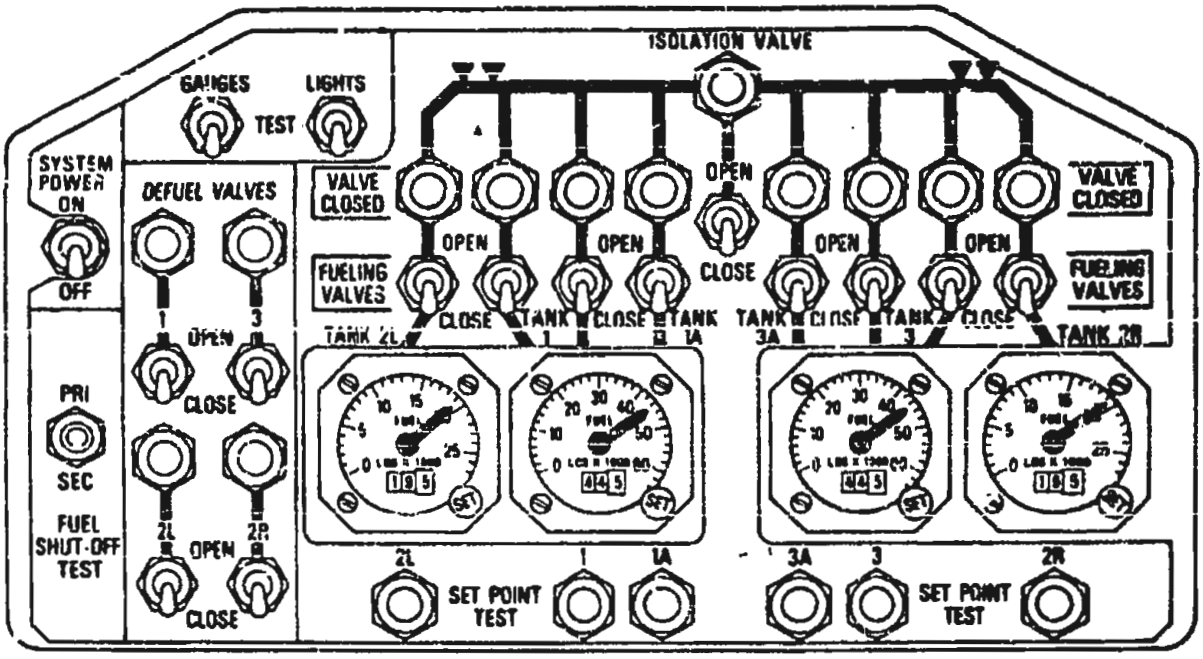
(E)

M1-0000-28-1556

R Fuel Quantity Indicators
R Figure 1 (Sheet 2)

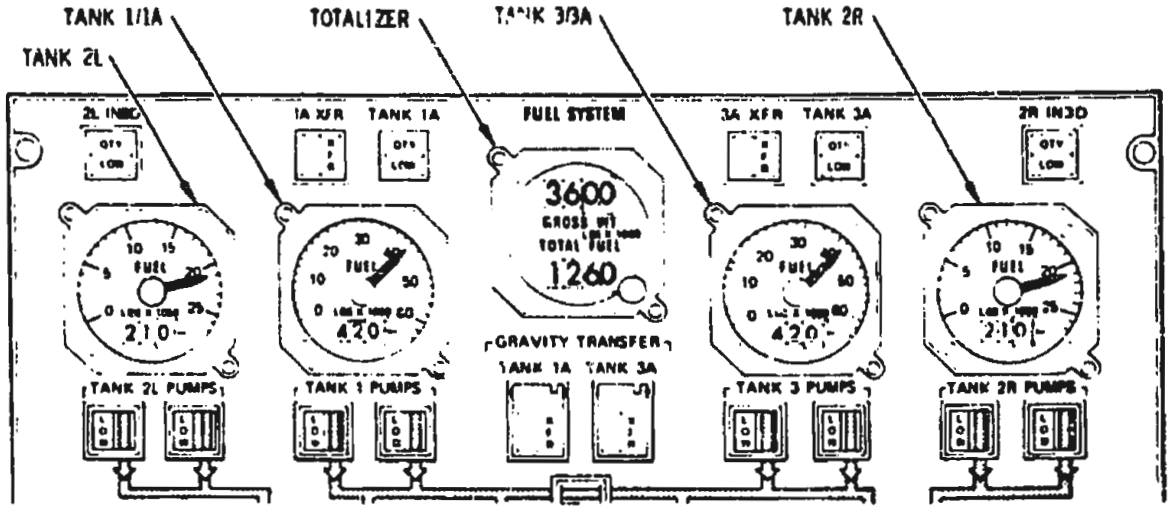
R EFFECTIVITY: 001-024, 027

R
R
002B



FUELING/DEFUELING PANEL

(H)

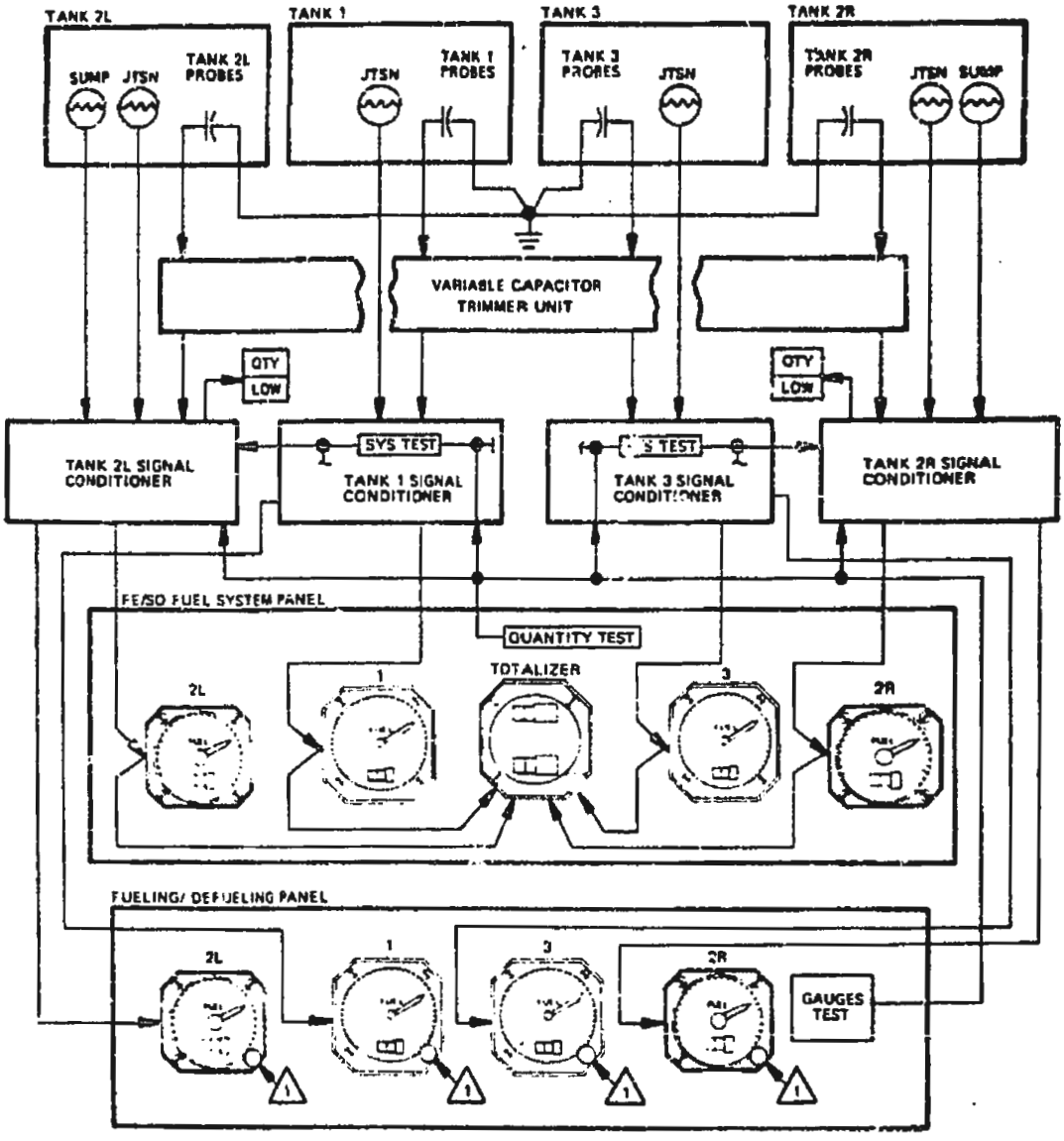


FE/SO FUEL SYSTEM PANEL

(G)

M1-0000-28-1565

Fuel Quantity Indicators
Figure 1 (Sheet 2)



NOTE:

1 SET POINT FUEL LOAD CONTROL

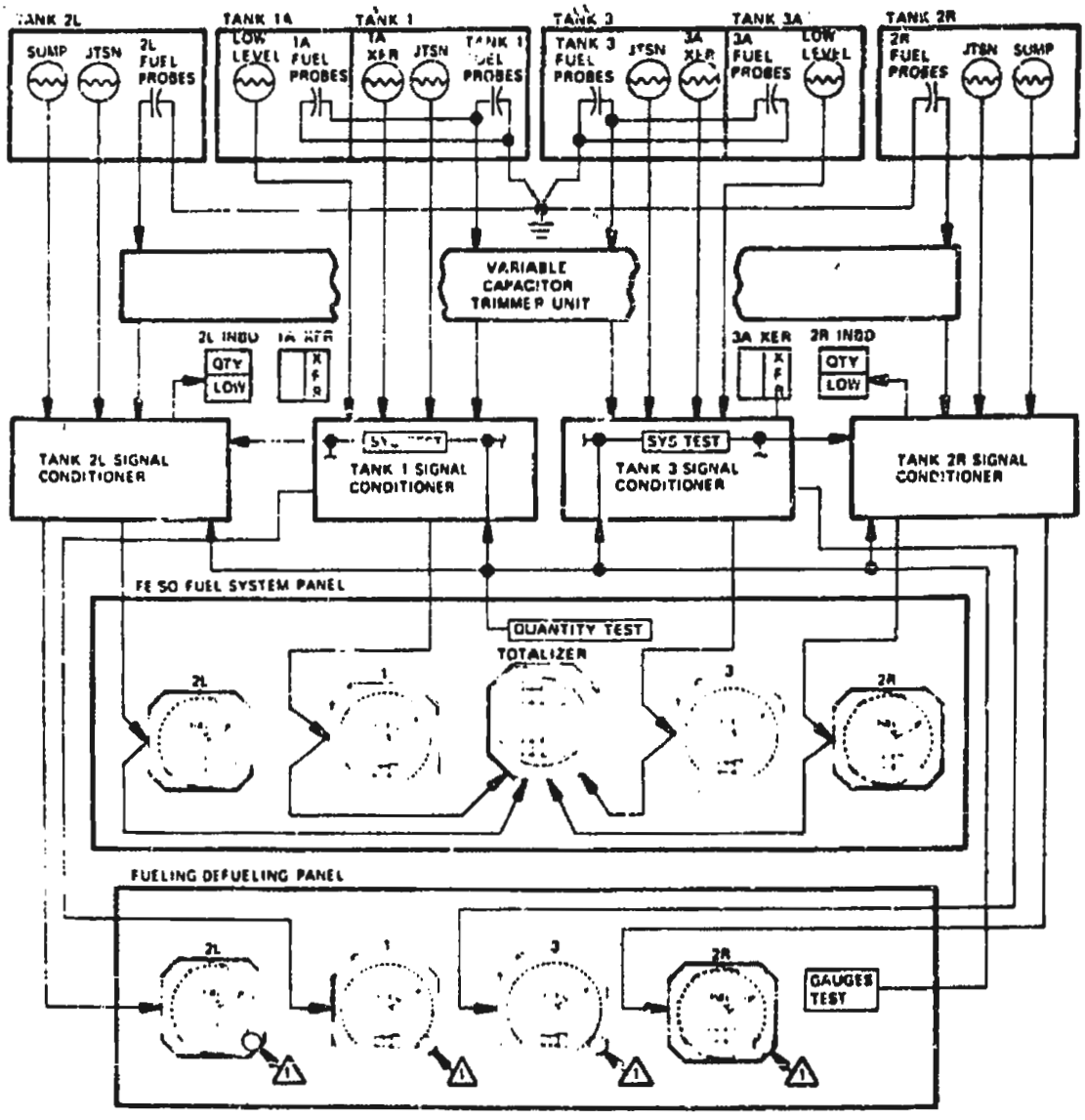
THERMISTOR

M1-0000-23-1882

R Fuel Quantity Indicating System Block Diagram
R Figure 2

R EFFECTIVITY: 001-024, 027

R
002B



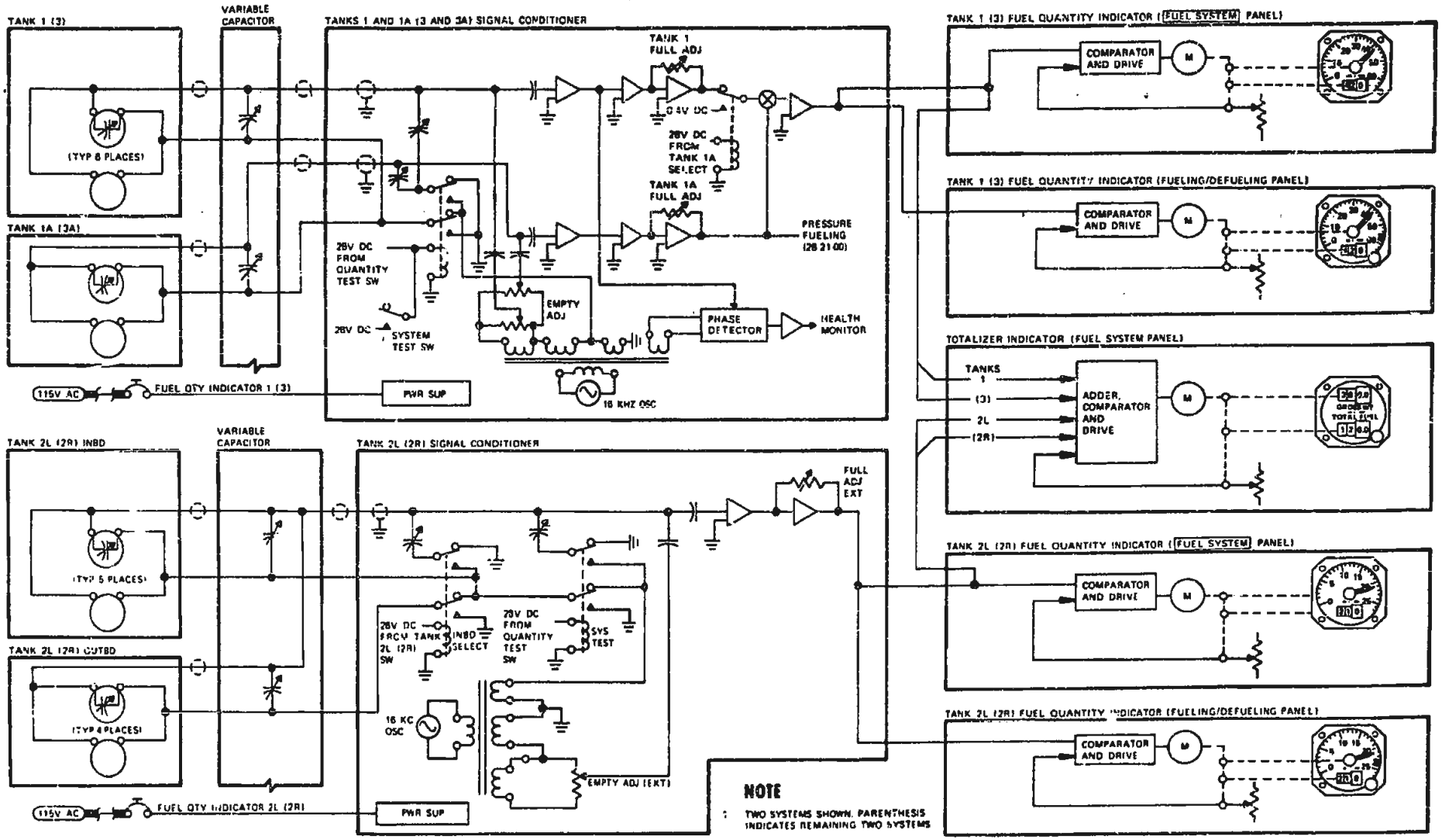
NOTE:

⚠ SET POINT FUEL LOAD CONTROL

THERMISTOR

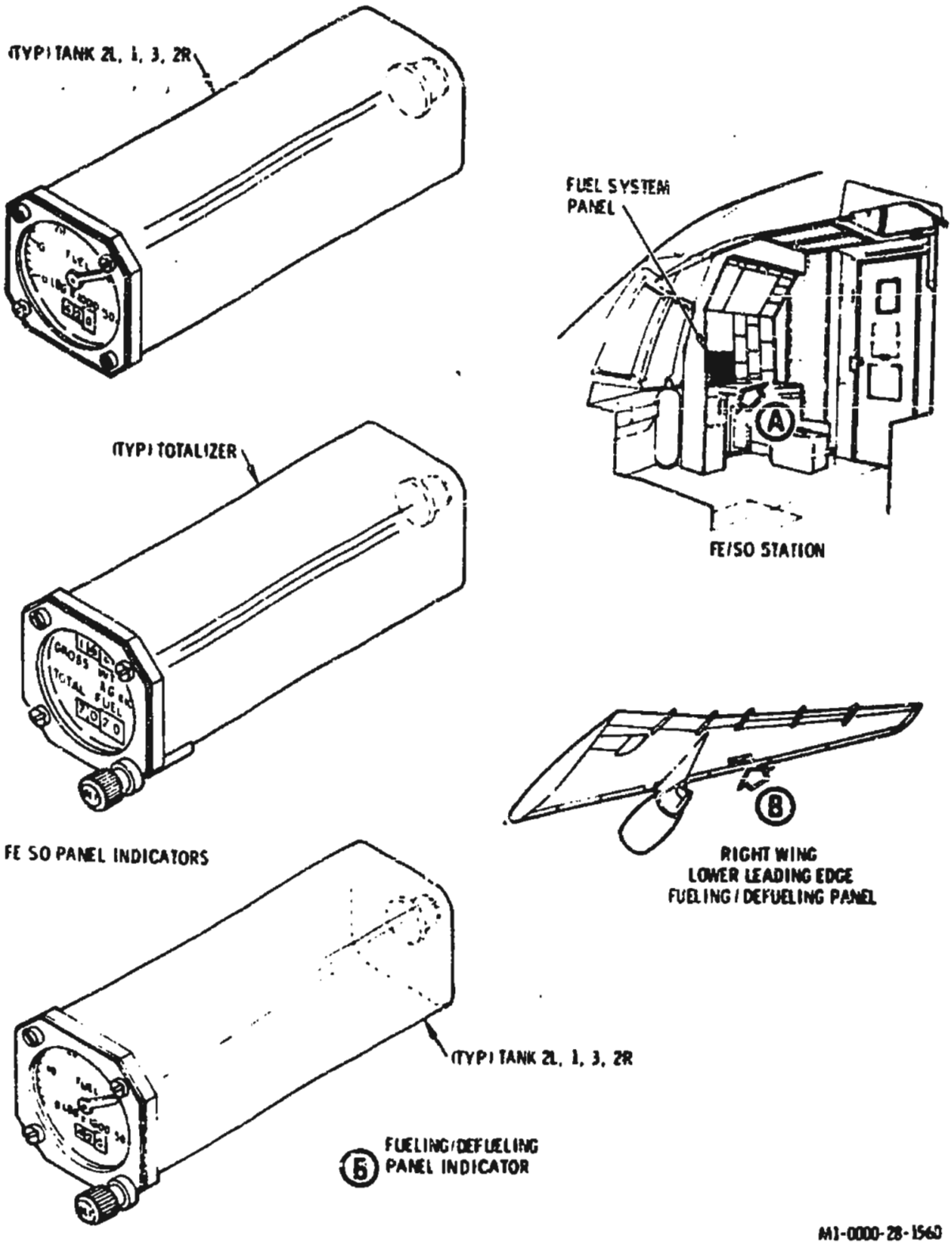
M1-0000-28-1563

Fuel Quantity Indicating System Block Diagram
Figure 2



R Fuel Quantity Indicating System Simplified Schematic
R Figure 3

R EFFECTIVITY: ALL
R
0028



Fuel Quantity Indicators
Figure 4

The indicator receives four signals representing fuel quantity of the four fuel tanks. The four signals are summed and applied as an input, representing total fuel quantity, to the dc comparator circuit. The dc comparator compares the total fuel signal to a signal representing the present indicator reading. When the two inputs represent the same quantity, the circuit remains in a quiescent state. When there is a difference in the two inputs, an unbalance signal is generated by the dc comparator to drive the stepping motor to a new balance point.

6. Signal Conditioner

A. Description

Four signal conditioners, one for each fuel tank, are located in the MESC, zone 137. Each signal conditioner (Ref. Fig. 1 and 5) consists of conditioning circuitry housed in a metal case. Full and empty adjustment potentiometers are located under protective caps on the case cover. These potentiometers are bench calibrated and are not to be adjusted on the aircraft.

Tanks 2L and 2R signal conditioners contain SUMP and JETTISON push-to-test lights and a BITE switch. Tanks 1A and 3A signal conditioners and SYS TEST and BITE switches.

These switches functionally check the quantity indicating system and the signal conditioner fuel level fuel transfer and fuel jettison sensor circuitry.

Each signal conditioner contains a health monitor circuit which provides, by means of a voltage output, indication whether fuel probe transmitter operation iw being degradated by micro-biological growth or fuel contamination.

B. Operation

The signal conditioner power supply furnishes operating voltages (Ref. Fig. 2 and 3) to the signal conditioner (Ref. Fig. 5) and, where applicable, to the level sensing circuit. The tank units (probes) provide a high impedance input signal to the conditioner bridge circuit. The bridge circuit is excited by a voltage regulated oscillator. The signal is processed with respect to the reference phase angle and inputs the AC amplifier. The amplified signal is furnished to the AC-DC converter that provides the DC output to the indicators. A secondary output of the AC amplifier is processed and appears as the health monitor output.

The fuel low level and jettison level control circuitry use thermistors as sensing elements. The circuitry measures the resistance of the thermistor beads. The dual differential comparator distinguishes the condition of the thermistor and causes a relay to operate. Operation of the relay provides 28V dc to cause the applicable FE/SO FUEL SYSTEM LOW switchlight to come on or the jettison circuit to be armed.

Signal conditioners for tanks 1 and 1A, and 3 and 3A also contain a similar circuit that prevents overfilling the wing tanks from the fuselage tanks (Ref. 28-27-00).

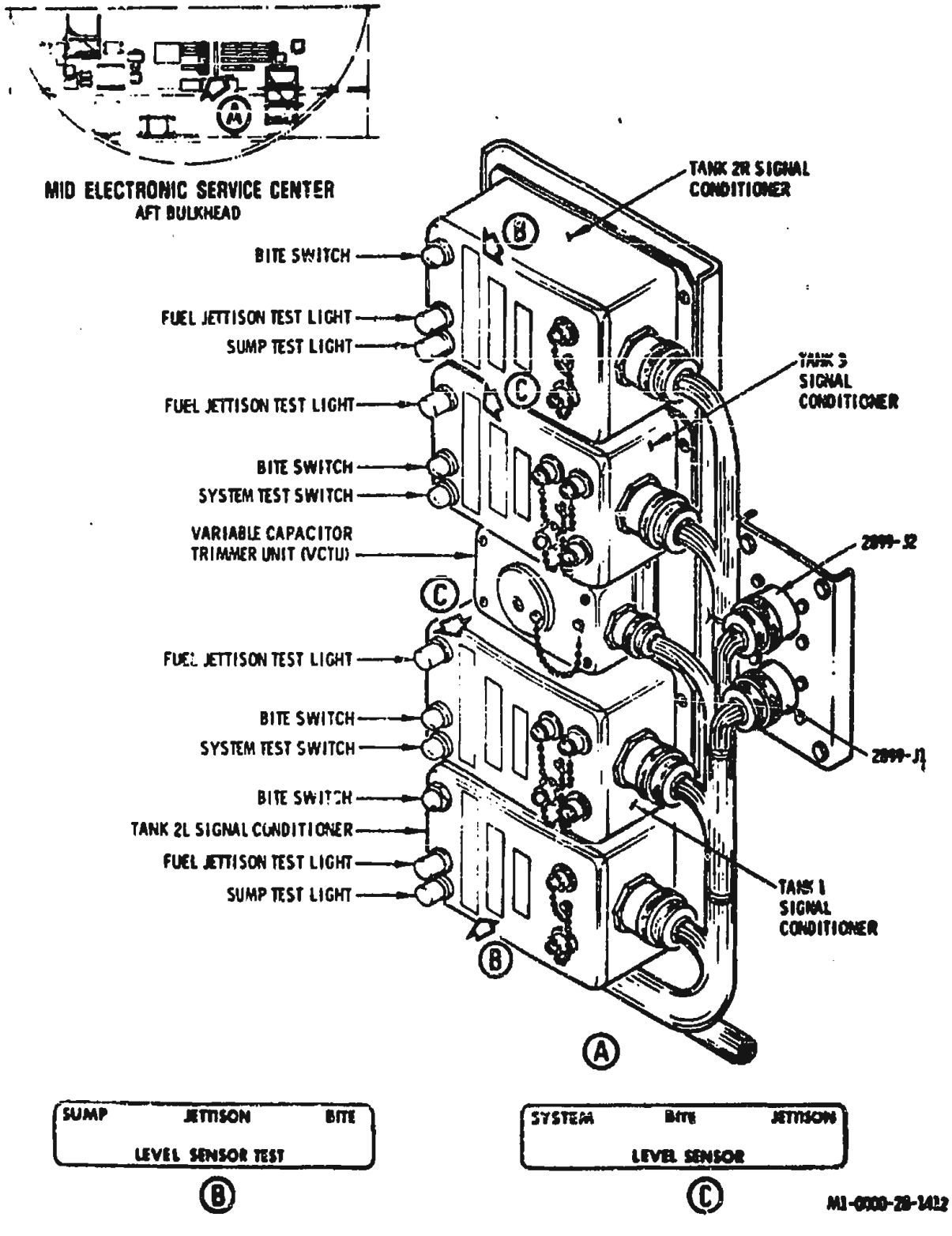
Actuation of the FE/SO QUANTITY TEST switch substitutes a fixed capacitor for the probes. The value of this capacitor is such that a maximum output signal is generated in the conditioner unit causing the indicators and totalizer to indicate maximum fuel quantity. The test also checks for an open or short circuited thermistor. Actuation of the BITE test switch checks the conditioner level sensing circuitry.

Circuitry is provided within the signal conditioner to determine whether excessive fuel contamination is occuring in the tanks. Contamination can occur from micro-biological sources, anti-static additives, moisture or pumped-in contaminates. Contamination of the fuel creates conditions producing a conductance across the tank units (probes) which may cause a fuel quantity indication error. It should be noted however, that the contamination levels established for the health monitor are very high, and it is doubtful whether aircraft normal service contamination indications would appear. Indications, if any, can be determined by the use of a vacuum tube voltmeter (VTVM) at the health monitor test. A VTVM reading of 0 to 2 volts dc indicates a nominal contamination level; a 2 to 4V dc reading is considered an above normal contamination level. A reading of 4 to 5V dc indicates contamination in excess of that which the fuel quantity gaging system can tolerate.

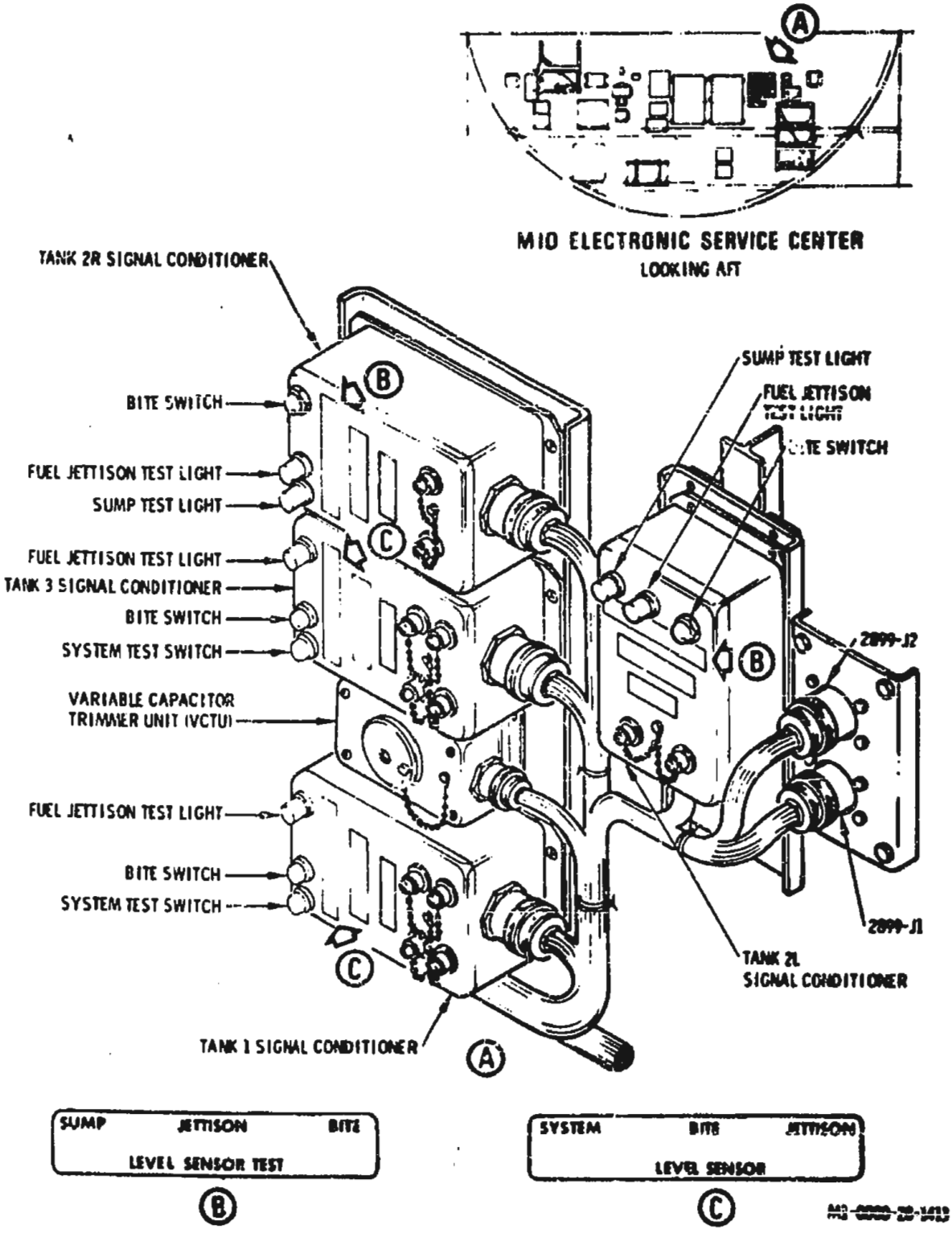
7. Variable Capacitor Trimmer Unit (VCTU)

A. Description and Operation

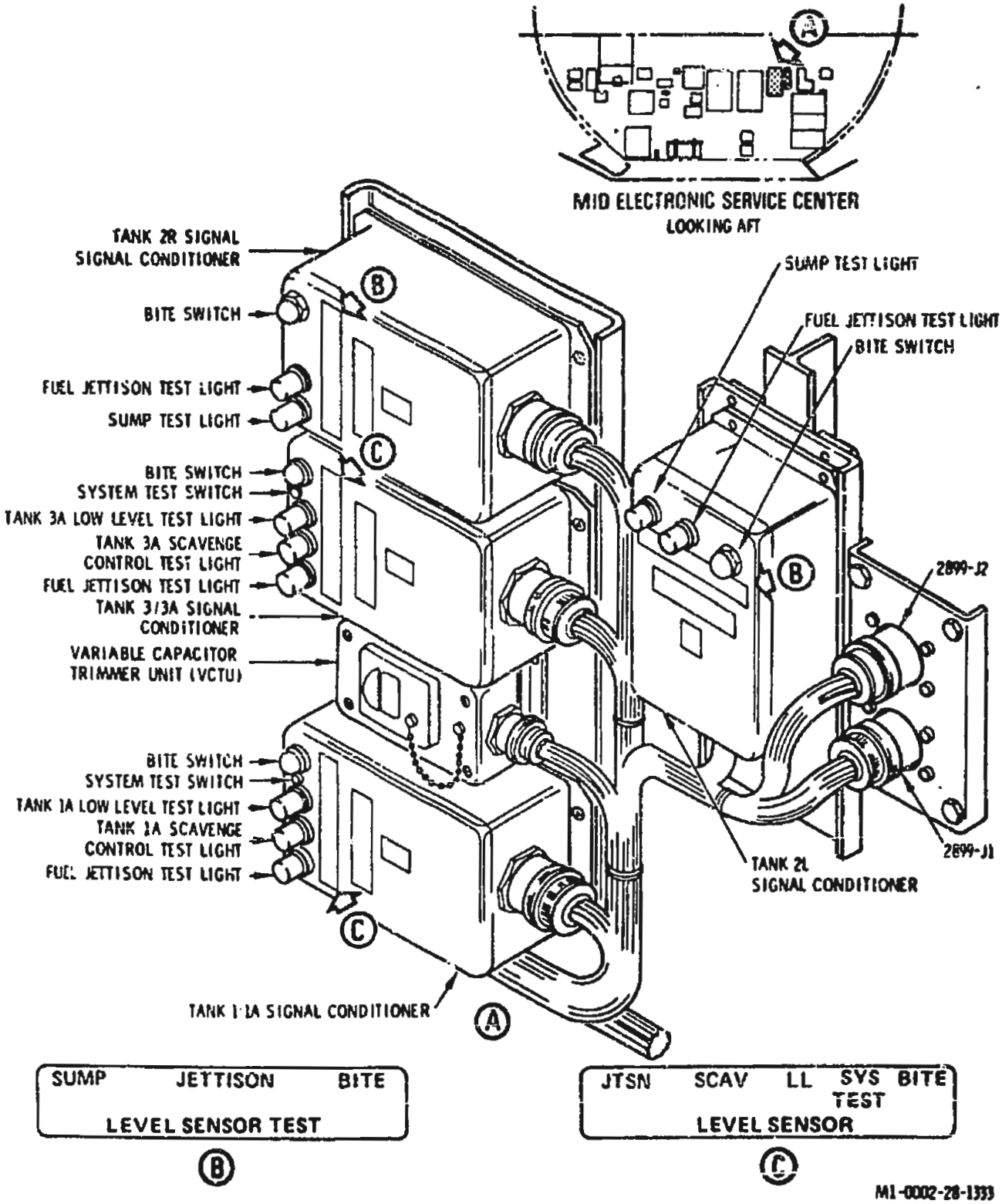
The variable capacitor trimmer unit (located in the MESC) contains all stable variable capacitors (Ref. Fig. 5). These capacitors, located under a cover, are readily accessible for adjustment. The unit provides a means for calibration of each set of dry transmitter probes to a predetermined standard capacitance value. This capability eliminates tolerance buildup of the tank units.



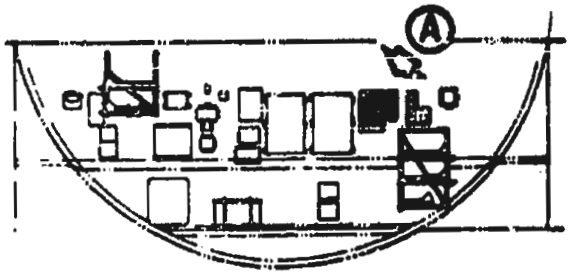
Fuel Quantity Indicating System Signal Conditioners
Figure 5



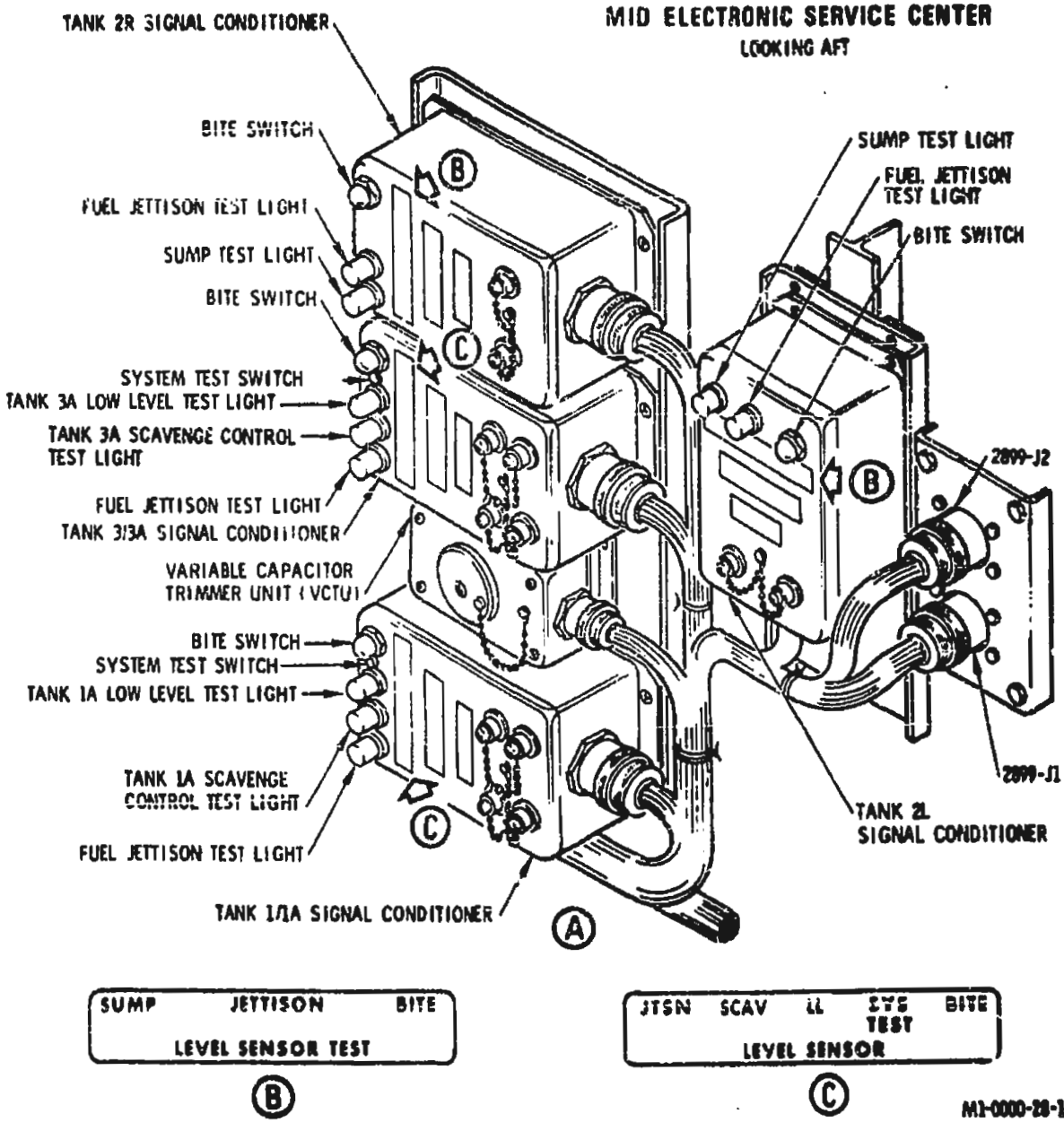
Fuel Quantity Indicating System Signal Conditioners
Figure 5



Fuel Quantity Indicating System Signal Conditioners
Figure 5



MID ELECTRONIC SERVICE CENTER
LOOKING AFT



Fuel Quantity Indicating System Signal Conditioners
Figure 5

8. Fuel Quantity Transmitter Probes

A. Description

The fuel quantity transmitter probes (Ref. Fig. 6 and 7) are capacitance type devices. The wing probes consist of two metal tubes (one within the other), a removable flange, a scuff cap, and a terminal block. The center section probes consist of two metal tubes (one within the other) with mounting brackets and a terminal block. A low fuel-level sensing thermistor is mounted on one of the probes in each
R inboard compartment (tanks 2L and 2R). One probe in each fuel tank (four total) has a jettison stop thermistor mounted on it.

The two metal tubes are mounted one inside the other. Concentricity of the tubes is controlled by teflon insulating spacers. The spacers are retained in place through the outer tube by insulator rings and spring clamps.

When installed in the fuel tank, the probe becomes a capacitor with the fuel as the dielectric. The metal tubes are the two plates of the capacitor and the value of the capacitance varies with the height of fuel in the tank.

9. Low-Level Sensing System (Ref. Fig. 8 and Fig. 9)

A. Description

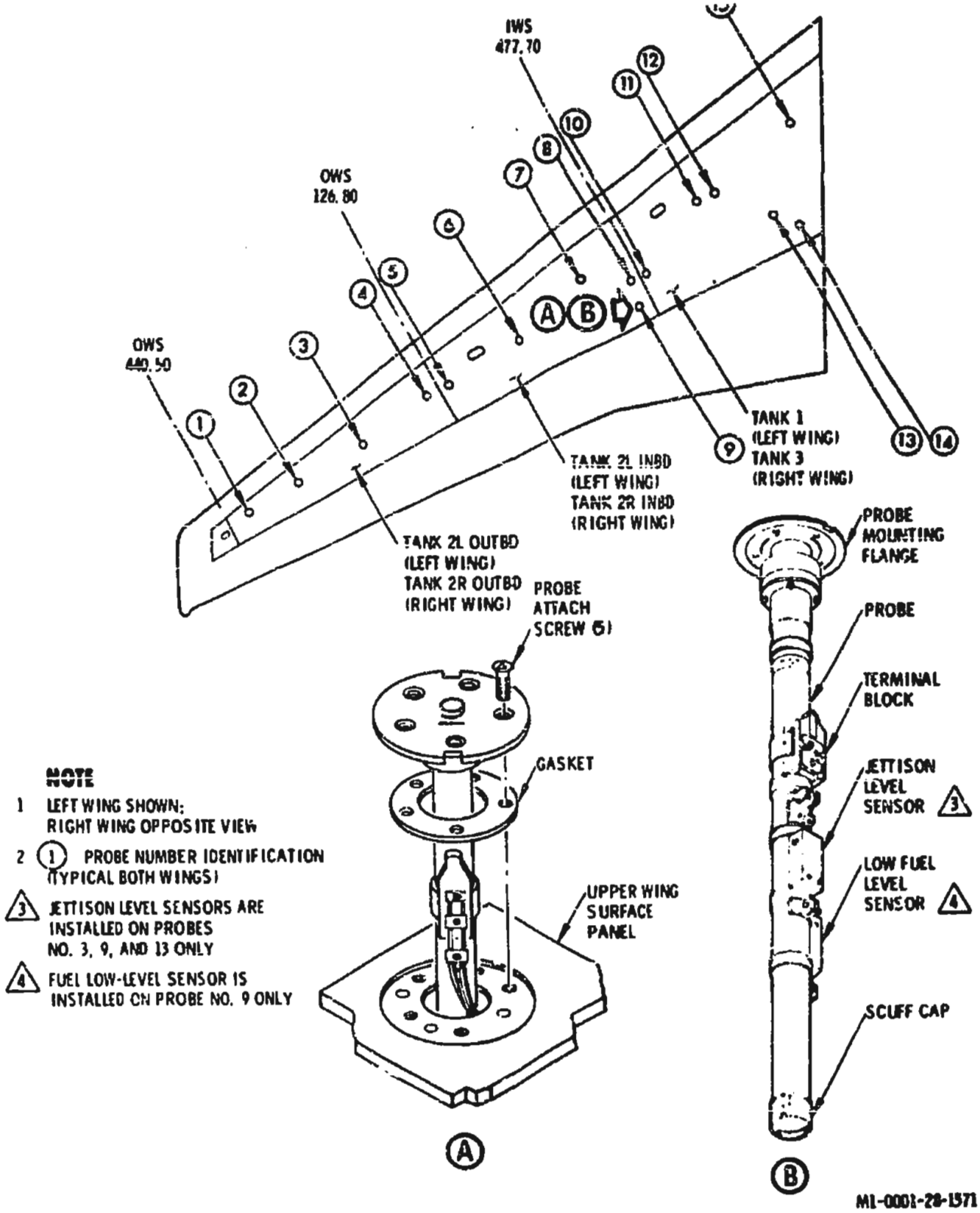
A low quantity fuel level of approximately 700 lbs (318 kg) for tanks 2L and 2R is indicated by illumination of the LOW legend on 2L INBD and 2R INBD switchlights on the FE/SO FUEL SYSTEM panel.

On aircraft 025, 026, 028-999,
in addition, a low quantity fuel level of approximately 175 lbs (80 kg) for tanks 1A and 3A is indicated by illumination of the LOW legend on TANK 1A and TANK 3A switchlights on the same FUEL SYSTEM panel.

The FUEL SYSTEM light legend on the pilots caution and warning panel (CAWP) is also illuminated along with the 2L INBD and 2R INBD switchlights.

A low fuel level in tanks 2L/2R is sensed by a thermistor mounted on tank probe No. 9 (Ref. Fig. 6).

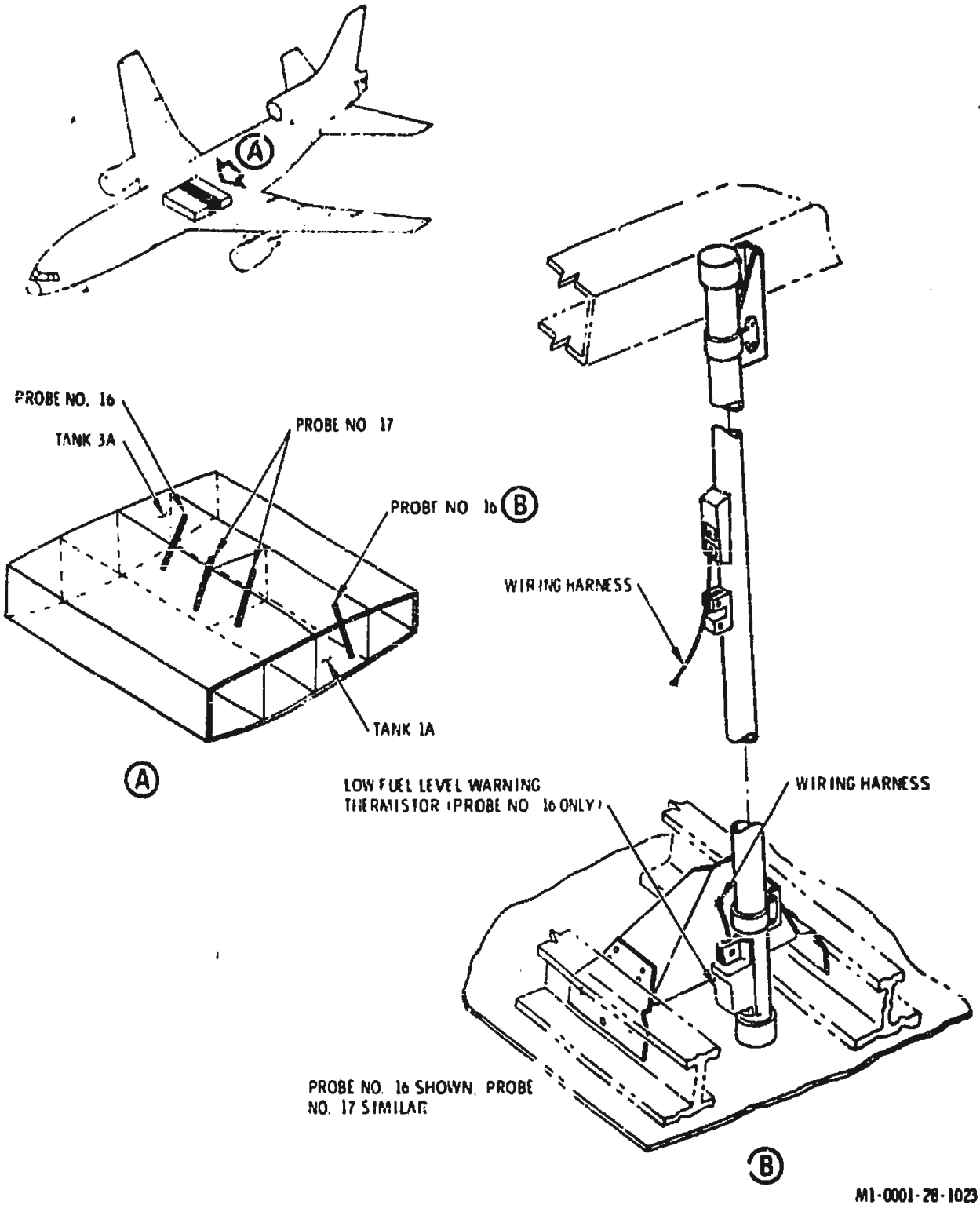
On aircraft 025, 026, 028-999,
low fuel level in tanks 1A/3A is sensed by a thermistor mounted on tank probe No. 16 (Ref. Fig. 7).



R Wing Tank Fuel Transmitter Probes
R Figure 6

EFFECTIVITY: ALL

002B



Tank 1A/3A Fuel Quantity Transmitter Probes
Figure 7

R The thermistor is basically a resistor having a high negative temperature coefficient and is very sensitive to the cooling medium surrounding the unit. When immersed in fuel the thermistor is cooled and its resistance is high. When uncovered and exposed to air-fuel vapors its resistance is low. Thermistor resistance is applied to the respective tank signal conditioners.

B. Operation

Whenever the fuel level drops low enough to uncover the thermistor, a relay in the respective tank signal conditioner is energized. With the relay energized, 28V dc from the DC GND SVCE BUS is applied through the relay contacts and ILCB to the corresponding tank LOW switchlight. The same response occurs when the BITE switch on the signal conditioner is depressed to test the circuit. This test causes the LOW light to come on and indicates that the low level indication circuit is functioning properly.

R Each of the above switchlights also contains a QTY light
R indication.

R On aircraft 001-024, 027,
R when the switchlight is depressed (latched in), the QTY
R legend will illuminate and the respective tank 2L and 2R
R fuel quantity indicators display only the amount of fuel in
R the inboard sections of tanks 2L and 2R.

R On aircraft 025, 026, 028-999,
R when the switchlight is depressed (latched in), the QTY
R legend will illuminate and the respective tank 1, 2L, 2R,
R and 3 fuel quantity indicators display only the amount of
R fuel in the tank 2L and 2R inboard sections and tanks 1A and
R 3A.

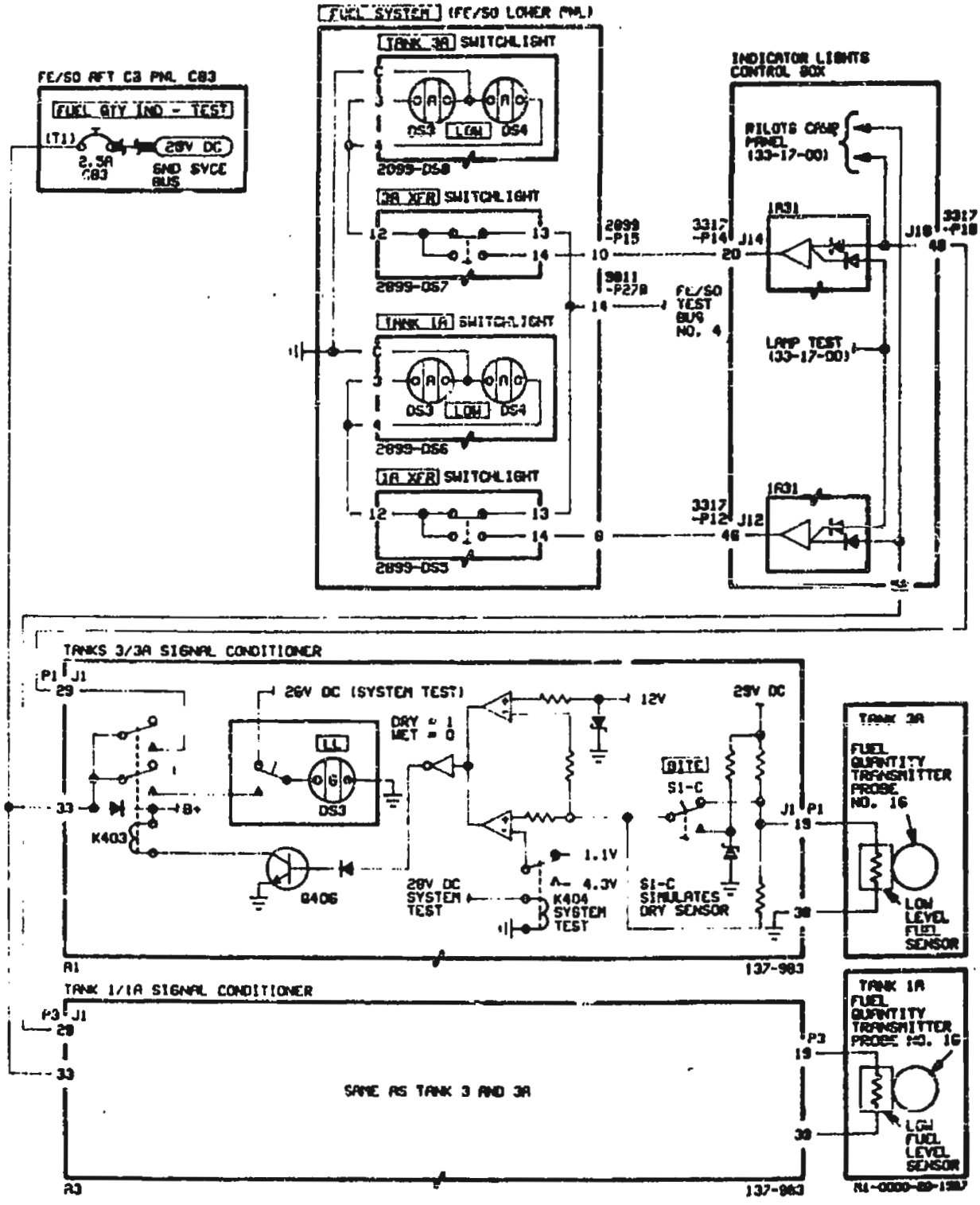
R The low fuel level indicating circuit will remain active
R regardless of switchlight position.

R 10. Sight Gage

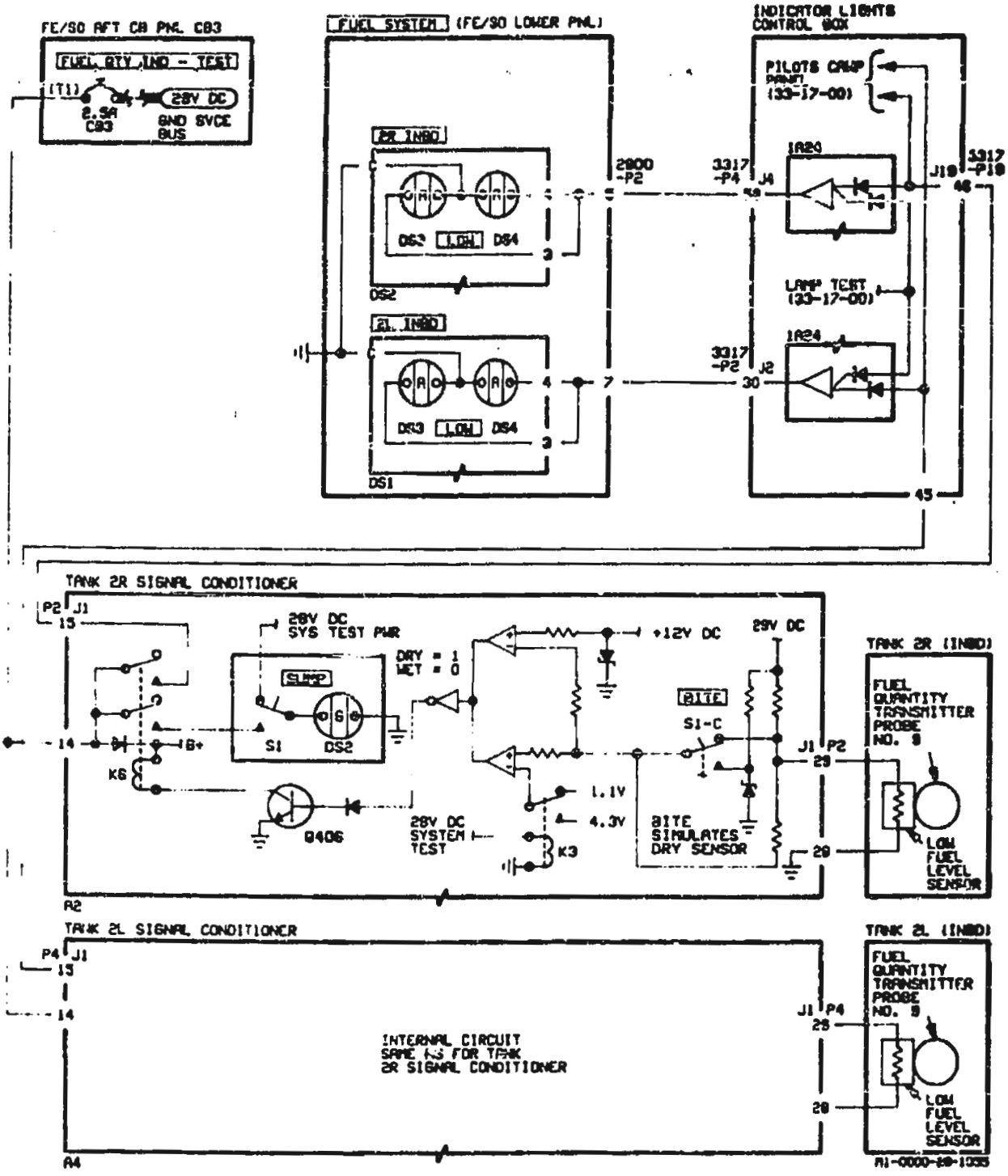
R A. Description and Operation

R On aircraft 001-024, 027,
R six fuel level sight gages are located in each wing lower
R surface to display fuel tank quantity levels (Ref. Fig. 1
R and 10).

R On aircraft 025, 026, 028-999,
R six fuel level sign gages are located in each wing lower



R Tank 1/1A and 3/3A Low Fuel Indication Schematic
R Figure 8



R Tank 2L/2R Low Fuel Indication Schematic
R Figure 9

EFFECTIVITY: ALL

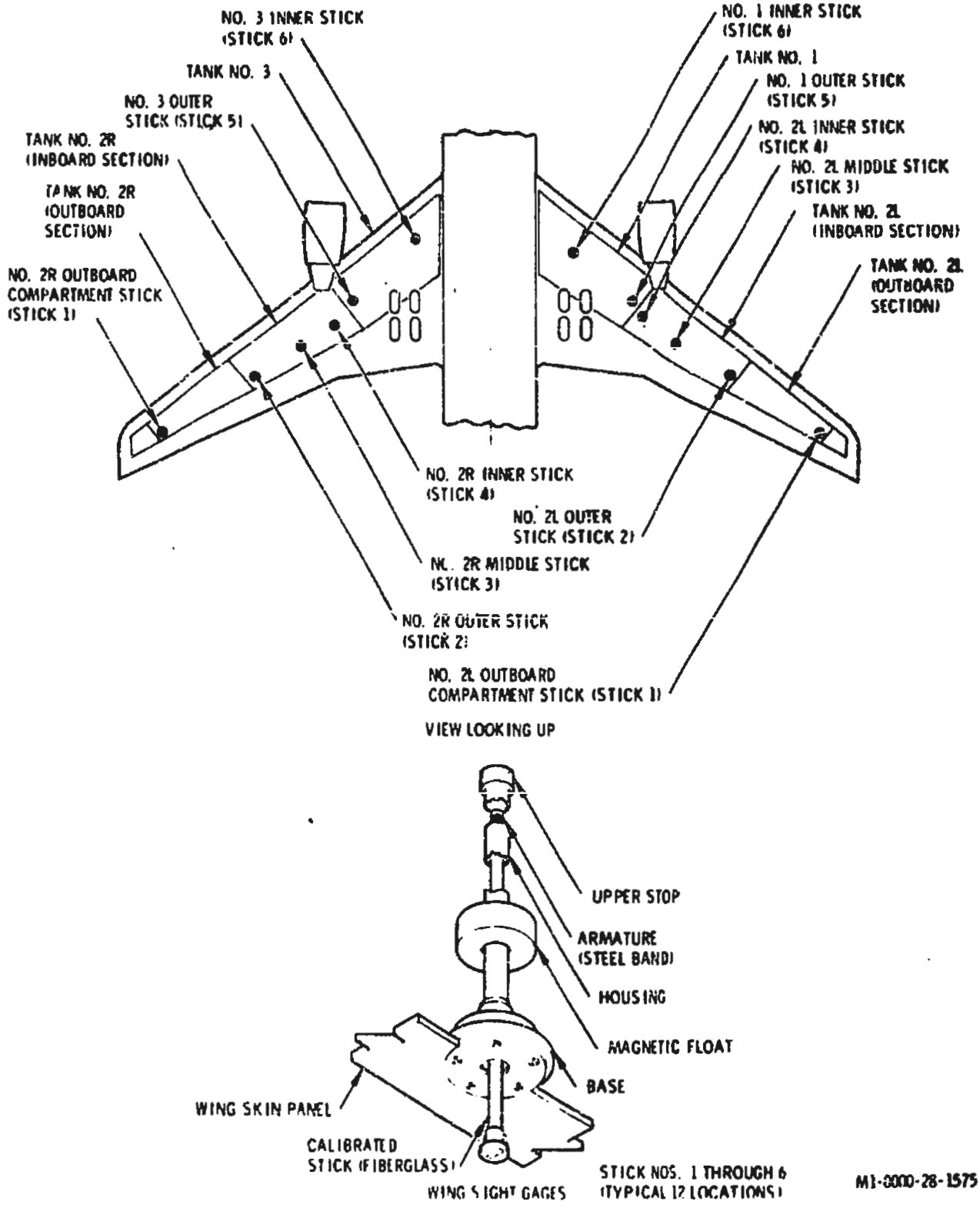
0028

R surface, and two under the fuselage to display fuel tank
R quantity levels (Ref. Fig. 1 and 10).

The outer tubular housing provides a support for the float which is free to rise or fall with the tank fuel level. The float contains embedded permanent magnets which slide along the surface of the outer housing.

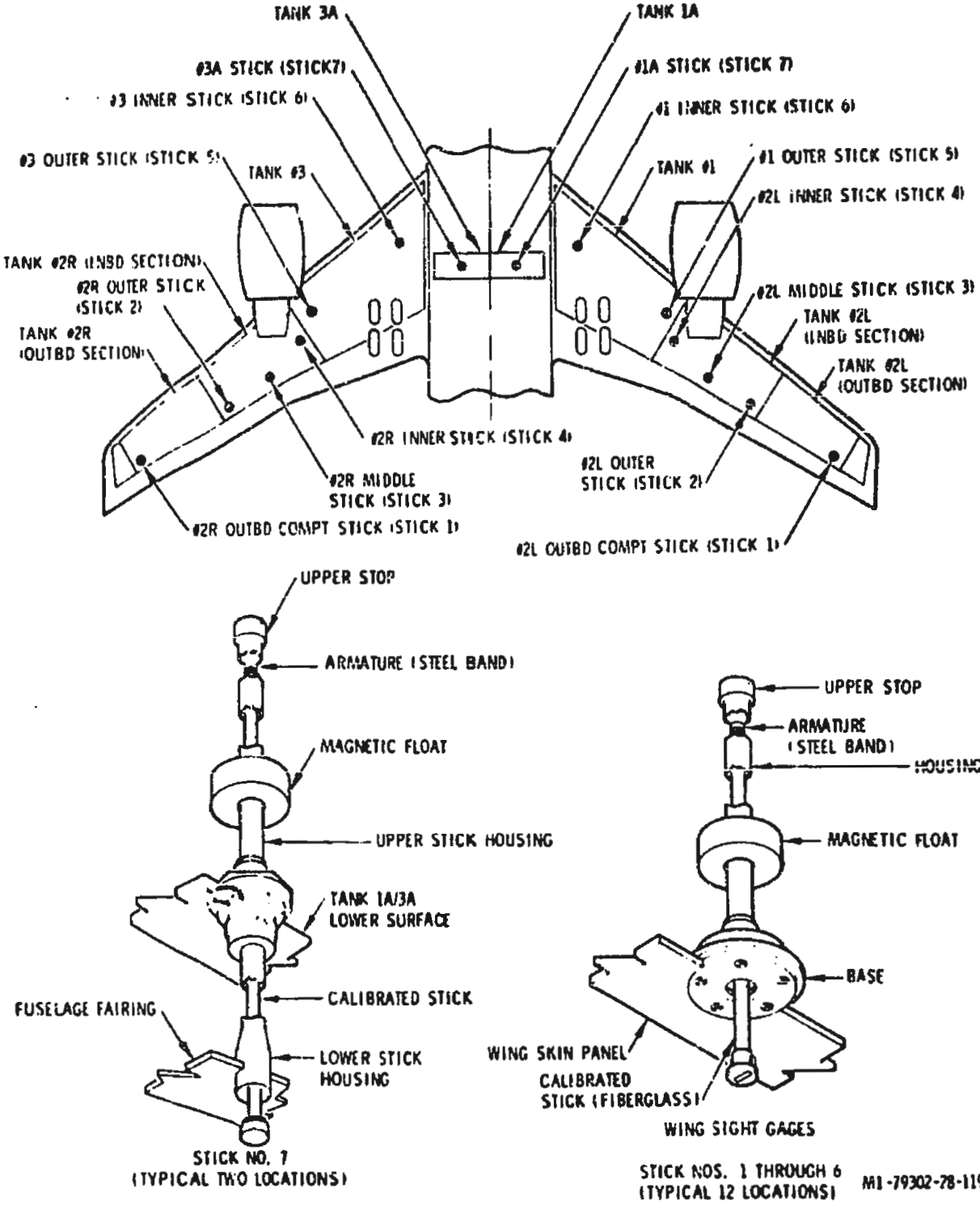
A stick, calibrated to indicate fuel quantity, is located within the housing. This stick is secured in the fully retracted position by a bayonet lock. When the bayonet lock is released, the stick extends, by gravity, from beneath the wing or fuselage. The upper end of the stick contains a ferrous metal armature. When the stick extends to the point where the armature is aligned with the magnets embedded in the float, magnetic latching occurs. The stick is then magnetically coupled to the float, rising or falling as the float follows the fuel level.

When fuel measurement is completed, the stick is pushed back to the fully retracted position and locked. As the stick is locked, the magnetic latch with the float is disengaged. The float then seeks the fuel level, where it remains until the next measurement operation.


NO. 3 INNER STICK (STICK 6)
TANK NO. 3
NO. 3 OUTER STICK (STICK 5)
TANK NO. 2R (INBOARD SECTION)
TANK NO. 2R (OUTBOARD SECTION)
NO. 2R OUTBOARD COMPARTMENT STICK (STICK 1)
NO. 1 INNER STICK (STICK 6)
TANK NO. 1
NO. 1 OUTER STICK (STICK 5)
NO. 2L INNER STICK (STICK 4)
NO. 2L MIDDLE STICK (STICK 3)
TANK NO. 2L (INBOARD SECTION)
TANK NO. 2L (OUTBOARD SECTION)
NO. 2R INNER STICK (STICK 4)
NO. 2L OUTER STICK (STICK 2)
NO. 2R MIDDLE STICK (STICK 3)
NO. 2R OUTER STICK (STICK 2)
NO. 2L OUTBOARD COMPARTMENT STICK (STICK 1)
VIEW LOOKING UP
UPPER STOP
ARMATURE (STEEL BAND)
HOUSING
MAGNETIC FLOAT
BASE
WING SKIN PANEL
CALIBRATED STICK (FIBERGLASS)
WING SIGHT GAGES
STICK NOS. 1 THROUGH 6 (TYPICAL 12 LOCATIONS)
M1-3000-28-1575

R Fuel Level Sight Gages
R Figure 10

R EFFECTIVITY: 001-024, 027
R
002B



R Fuel Level Sight Gages
R Figure 10

R EFFECTIVITY: 025, 026, 028-999

FUEL QUANTITY INDICATING SYSTEM - FAULT ISOLATION

1. General

Reference data and fault isolation procedures for troubleshooting fuel quantity indicating system faults are included in this section of the manual. A fuel quantity indicating system malfunction detected by the flight crew is normally entered in the aircraft flight log book and reported to maintenance personnel by a FIRM fault code number. This number and the flight log book write-up can be found in the Chapter 28 Fault Code Index. The index specifies the maintenance manual section, fault isolation diagram figure number and, where appropriate, a block number indicating the diagram entry point containing the fault isolation procedure. When no block number is specified, the diagram entry point is block 1.

Prerequisites listed at the top of each diagram identify mandatory preliminary steps and circuit breakers that must be closed before initiating any fault isolation step.

Schematic diagrams, identified by a SCHEM number, supplement fault isolation procedures as maintenance aids. The schematics show the basic system circuitry necessary for troubleshooting and include cross-reference indexes to the wiring diagram manual pages required for checking component interconnect wiring.

2. Supplemental data

Supplementary data includes functional tests, checkout tests, BITE checks and other general information that can be helpful in performing fault isolation. Supplementary data in this section is listed in Table 101.

Supplemental Data
Table 101

TABLE FIGURE NO.	TITLE
Table 102	Fuel Quantity Transmitter Probe Capacitance

Fuel Quantity Transmitter Probe Capacitance
Table 102

	PROBE LOCATION	PROBE NO.	CAPACITANCE (pf) DRY PROBE	CAPACITANCE (pf) WET PROBE
	TANK 2L & 2R (OUTBD)	1	16.3 (±0.50)	16.3 (±0.75)
	TANK 2L & 2R (OUTBD)	2	25.7 (±0.50)	25.7 (±0.75)
	TANK 2L & 2R (OUTBD)	3	25.9 (±0.50)	25.9 (±0.75)
CR	TANK 2L & 2R (OUTBD)	4	34.8 (±0.50)	34.8 (±0.75)*
	TANK 2L & 2R (INBD)	5	44.1 (±0.50)	44.1 (±0.69)
	TANK 2L & 2R (INBD)	6	57.4 (±0.60)	57.4 (±0.83)
	TANK 2L & 2R (INBD)	7	44.4 (±0.50)	44.4 (±0.69)
CR	TANK 2L & 2R (INBD)	8	53.2 (±0.53)	53.2 (±0.73)*
CR	TANK 2L & 2R (INBD)	9	17.8 (±0.50)	17.8 (±0.69)*
	TANK 1 & 3	10	62.5 (±0.60)	62.5 (±0.80)
	TANK 1 & 3	11	81.3 (±0.80)	81.3 (±1.08)
	TANK 1 & 3	12	100.3 (±1.00)	100.3 (±1.34)
	TANK 1 & 3	13	81.8 (±0.80)	81.8 (±1.07)
CR	TANK 1 & 3	14	45.9 (±0.50)	45.9 (±0.67)*
CR CR	TANK 1 & 3	15	147.2 (±1.50)	147.2 (±2.04)*

CR CR *If probes are out of tolerance high - insure probe is above tank fuel level.

3. Fault Isolation

Table 103 is a list of fault isolation data in this section of the manual.

Fault Isolation Data
Table 103

FIGURE NUMBER	TITLE
101	Component Location Index
102	Component Locator
103	Tank Quantity Gages Incorrect
104	Inboard Tank QTY Select Problems
105	QTY Light Problems
106	Totalizer Problems
107	Fuel Quantity Test Problems
108	Tank 2L or 2R LOW light did not come on
109	2L or 2R INBD LOW light on
SCHEM 1	Fuel Quantity Indicating System Power Distribution Schematic
SCHEM 2	Tank 1 Fuel Quantity Indicating System Schematic
SCHEM 3	Tank 3 Fuel Quantity Indicating System Schematic
SCHEM 4	Tank 2L Fuel Quantity Indicating System Schematic
SCHEM 5	Tank 2R Fuel Quantity Indicating System Schematic
SCHEM 6	Tank 2L/2R Low Fuel Level Indicating System Schematic

COMPONENT	QTY	AREA/ACCESS	REFERENCE
CIRCUIT BREAKERS:			
FUEL QTY IND – TEST 2841 – CB3	1	FLT STA/CB3 T1	*
FUEL QTY IND – 1 2841 – CB2	1	FLT STA/CB3 T2	*
FUEL QTY IND – 2L 2841 – CB1	1	FLT STA/CB3 T3	*
FUEL QTY IND – 2R 2841 – CB4	1	FLT STA/CB3 T4	*
FUEL QTY IND – 3 2841 – CB5	1	FLT STA/CB3 T5	*
FUEL SYS RPTR IND 2841 – CB2	1	GALLEY RT C9 PNL/A15	*
CONDITIONER, SIGNAL	4	MESC/192K, 137AZ	28-41-30/31
GAGE, FUEL LEVEL SIGHT – TK1, 3, 2L, 2R	12	WING TANK UPPER SURFACE	28-41-24
INDICATORS, FUEL QTY:			
TANK 2L/2R	2	FUELING/DEFUELING PNL	28-41-17
TANK 1/3	2	FUELING/DEFUELING PNL	28-41-18
TANK 2L/2R	2	FE/SO PNL FLT STA	28-41-20
TANK 1/3	2	FE/SO PNL FLT STA	28-41-21
TOTALIZER	1	FE/SO PNL FLT STA	28-41-19
PANEL:			
FE/SO FUEL SYSTEM	1	FE/SO CONSOLE – FLT STA	28-00-10
FUELING/DEFUELING PANEL	1	RT WING LE/621FB	28-21-99
PROBE, FUEL QTY XMTR 1, 2L, 2R, 3	30	WING TANK UPPER SURFACE	28-41-01
RELAYS:			
INBD QTY DISABLE (2821-K5)	1	FE/SO RLY PNL, FLT STA	*
REFUELING BUS XFR (2821 – K1)	1	MESC/137MZ, 131AR	*
SWITCH:			
2L INBD QTY	1	FE/SO FUEL SYS PNL	*
2R INBD QTY	1	FE/SO FUEL SYS PNL	*
UNIT, VARIABLE CAPACITANCE TRIMMER	1	MESC/192K, 137AZ	28-41-16

*SEE WM EQUIPMENT LIST

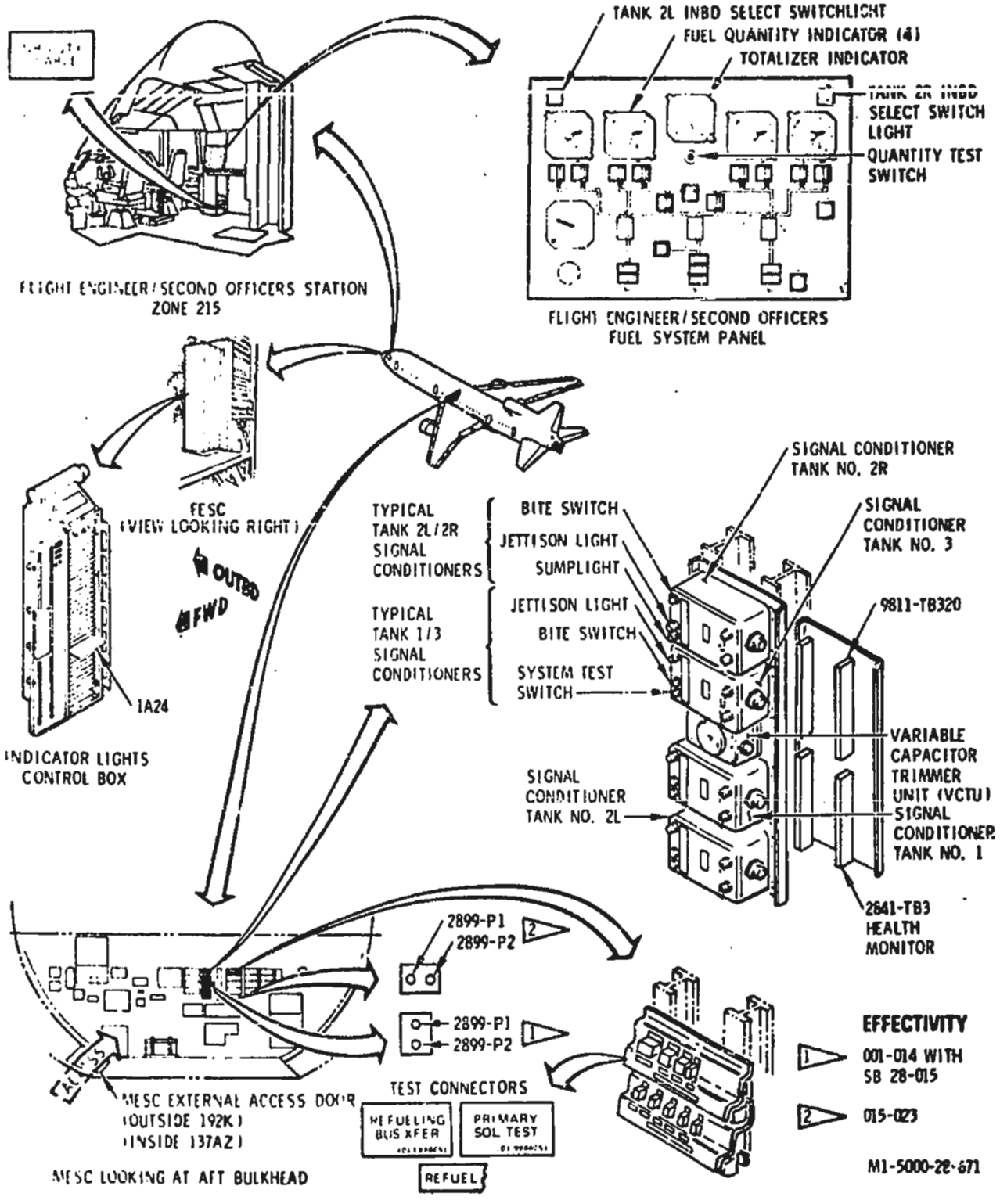
M1-0001-28-1483

R
R

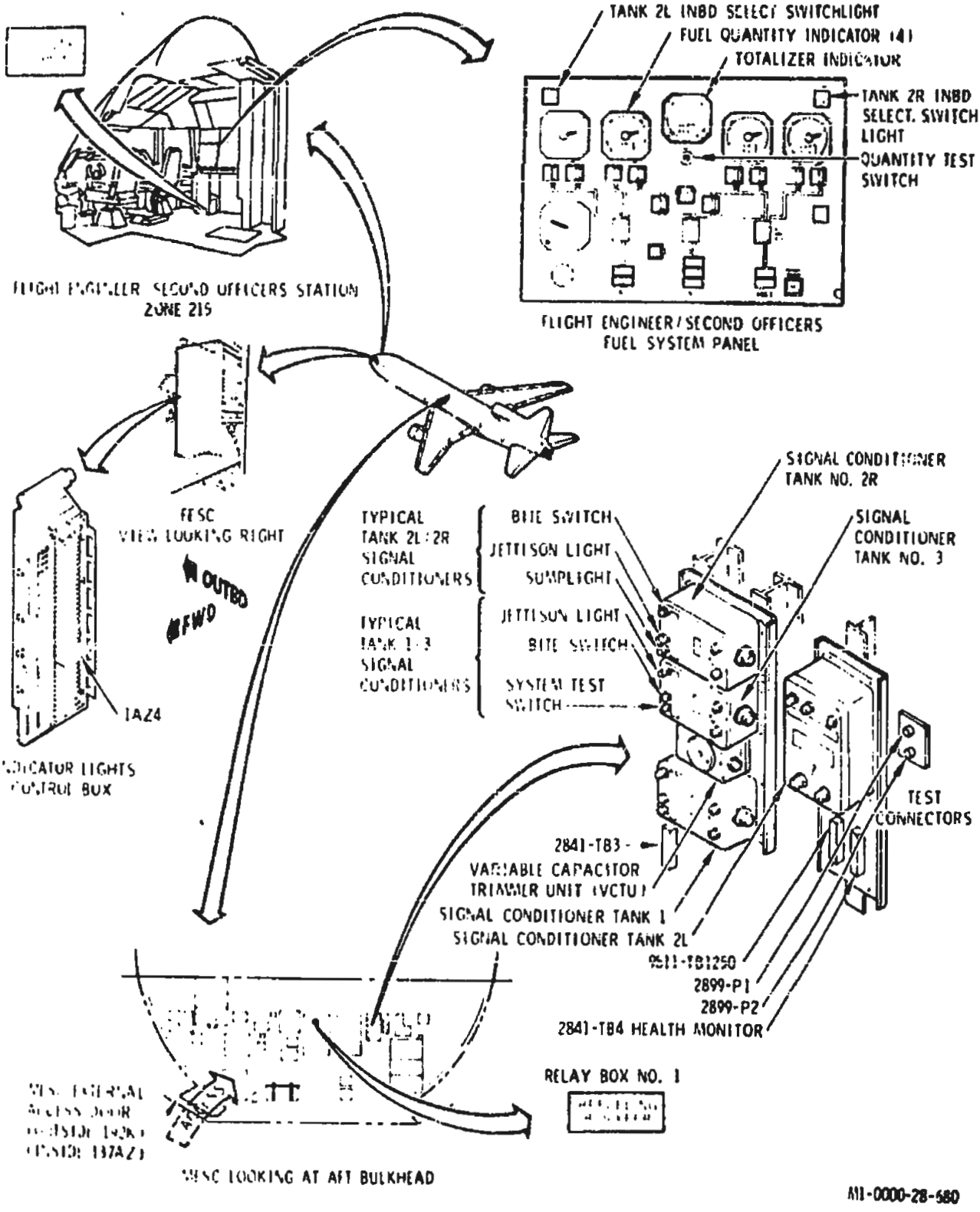
Component Location Index
Figure 101

EFFECTIVITY: 001-024, 027

001B



Component Locator
Figure 102 (Sheet 1)

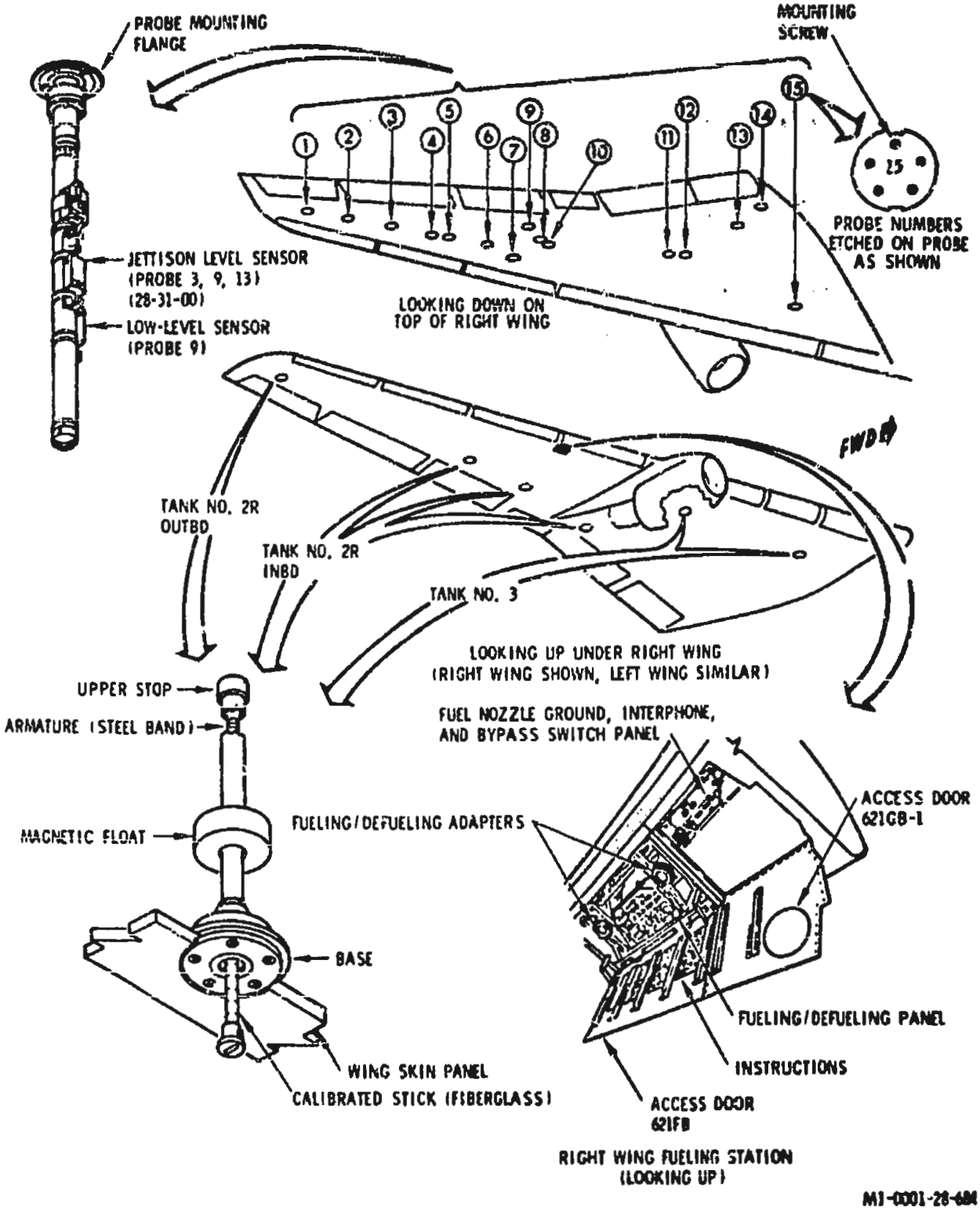


MI-0000-28-580

Component Locator
Figure 102 (Sheet 2)

R

EFFECTIVITY: 027



Component Locator
Figure 102 (Sheet 3)

R

EFFECTIVITY: 001-024, 027

0018

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: C83-T1 THRU T5
GALLEY RIGHT: 15A, 16H
GALLEY LEFT: 21B
FUEL SYSTEM PANEL
2L INBD, 2R INBD SWITS RELEASED,
QTY AND LOW LIGHTS OFF
FUELING/DEFUELING PANEL:
SYSTEM POWER SWITCH SET TO ON

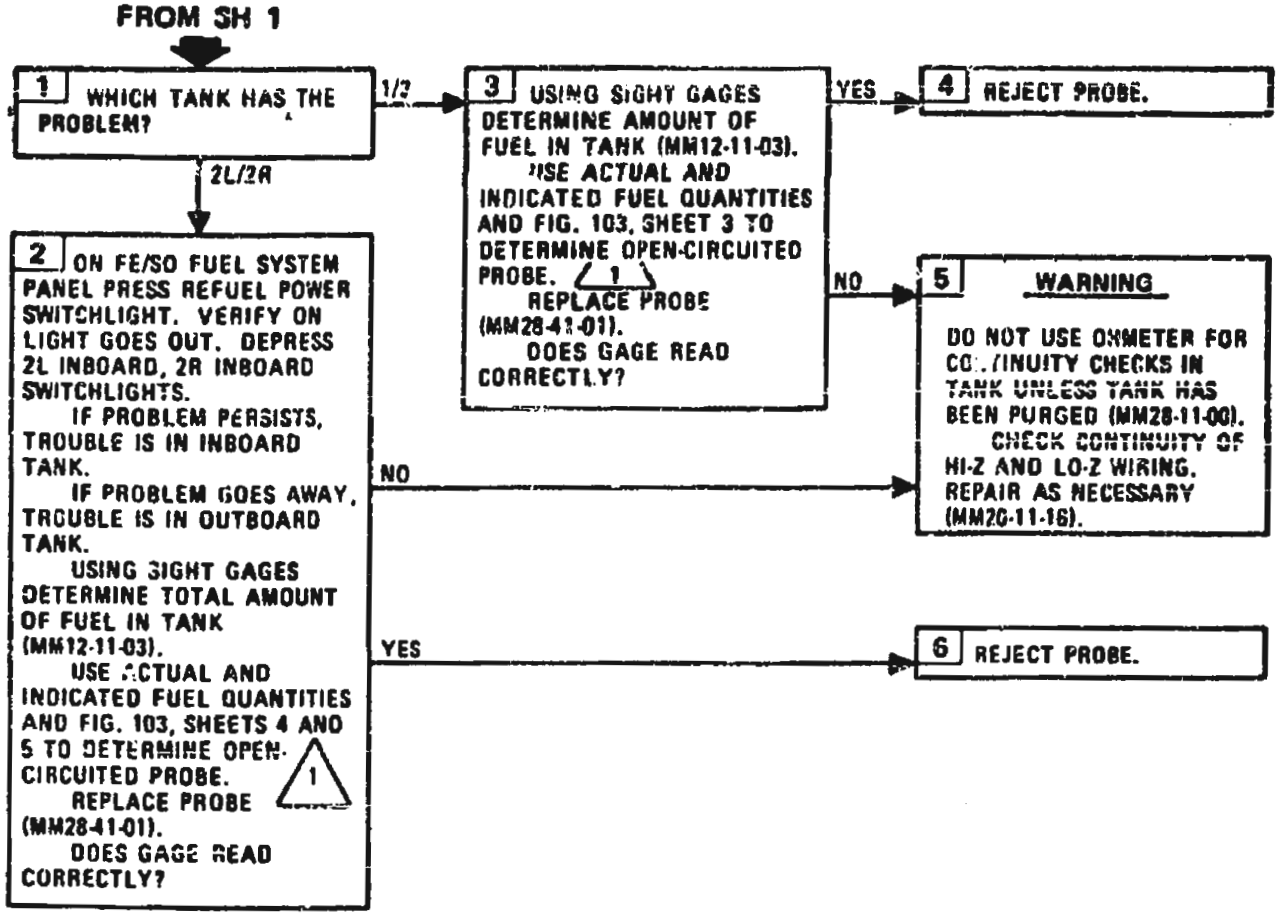
FUEL QUANTITY INDICATORS INCORRECT

1 WHICH INDICATOR(S) DO NOT READ CORRECTLY?
- FUELING PANEL INDICATORS → 4 DO ALL 4 FUELING PANEL INDICATORS READ INCORRECTLY?
  - ONLY ONE → 5 REPLACE FUELING PANEL INDICATOR (MM28-41-20).
  - ALL 4 → 6 REPLACE FUELING BUS TRANSFER RELAY 2821-K1, 137-583.
- ONE FE/SO AND SAME REPEATER INDICATOR → 2 IS INDICATION ERRATIC OR UNRELIABLE /1\ ?
  - YES → 8 UNRELIABLE - CHECK TANK PROBE WIRING FOR OPEN CIRCUITS IN HI-Z AND LOW-Z WIRES.
    IF FAULT PERSISTS REPLACE SIGNAL CONDITIONER AS FOLLOWS: TANK 1 OR 3 (MM28-41-30), TANK 2L OR 2R (MM-28-41-31).
    ERRATIC - CHECK CONTINUITY OF HI-Z SHIELD BETWEEN SIGNAL CONDITIONER AND TANK PROBE UNITS.
    IF FAULT PERSISTS CHECK CONNECTIONS AT EACH PROBE FOR CONDITION AND SECURITY.
    IF FAULT PERSISTS REPLACE SIGNAL CONDITIONER AS FOLLOWS: TANK 1 OR 3 (MM28-41-30), TANK 2L OR 2R (MM28-41-31).
    IF FAULT PERSISTS REPLACE VARIABLE CAPACITOR TRIMMER UNIT (MM28-41-16).
  - NO → 3 IS INDICATION AT HIGH OR LOW SCALE STOP, OR ALMOST ZERO?
    - YES → 9 USE FIELD CALIBRATION UNIT TO CHECK PROBE WIRING FOR PIN-TO-PIN AND PIN-TO-GROUND SHORTS.
      IF FAULT PERSISTS CHECK WIRING BETWEEN SIGNAL CONDITIONER PLUGS AND TANK WALL PLUG FOR CONTINUITY, AND FOR PIN-TO-PIN AND PIN-TO-GROUND SHORTS. REPAIR WIRING OR REPLACE VCTU (MM28-41-16).
      IF FAULT PERSISTS REPLACE SIGNAL CONDITIONER AS FOLLOWS: TANK 1 OR 3 (MM28-41-30), TANK 2L OR 2R (MM28-41-31).
    - NO → TO SHEET 2

NOTE
/1\ INDICATOR READS DIFFERENT IN AIR AND ON GROUND.

A1-0000-28-1587

R Fuel Quantity Indicators Incorrect
R Figure 103 (Sheet 1)

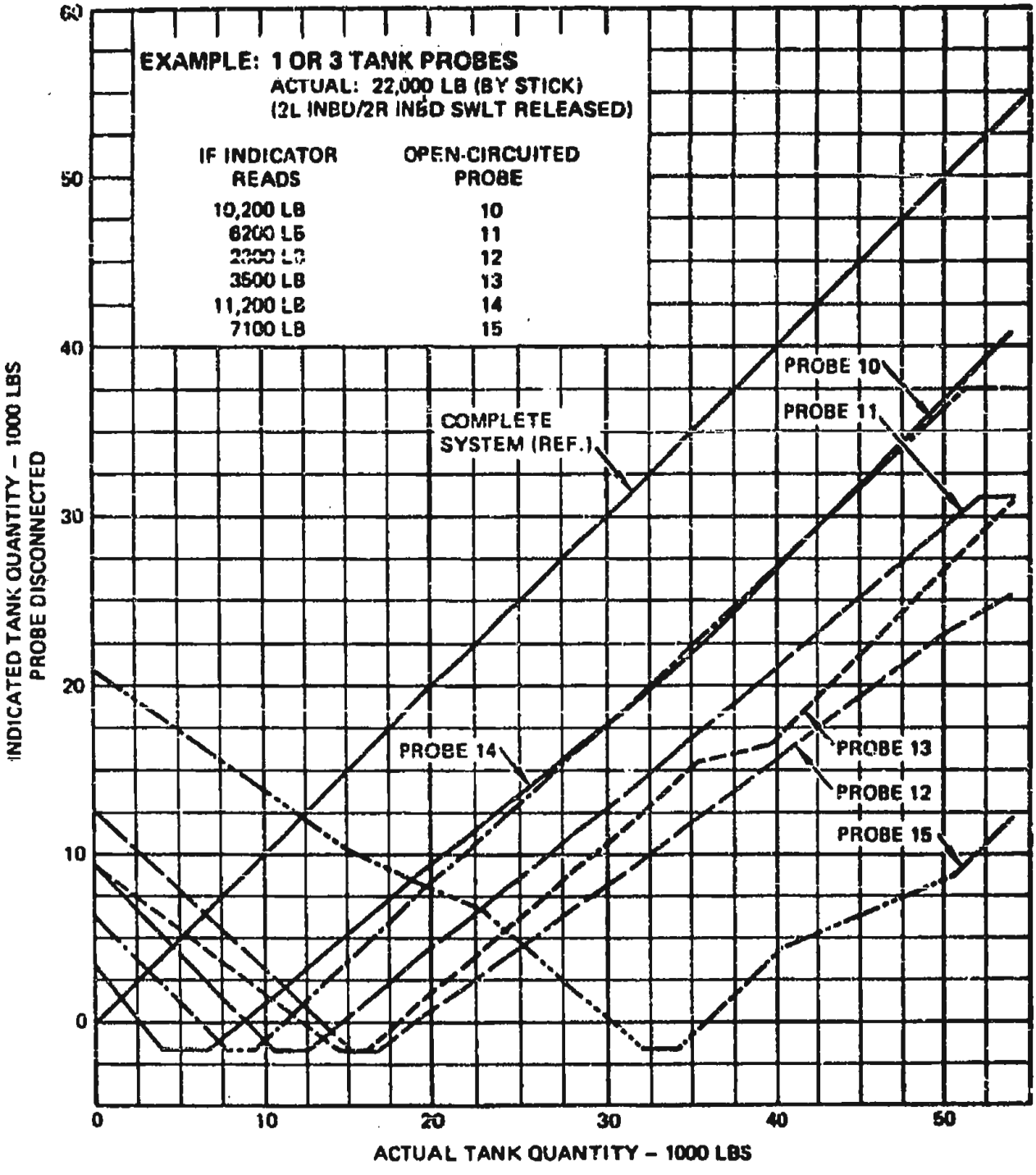

FROM SH 1
1 WHICH TANK HAS THE PROBLEM?
1/2
2L/2R
2 ON FE/SO FUEL SYSTEM PANEL PRESS REFUEL POWER SWITCHLIGHT. VERIFY ON LIGHT GOES OUT. DEPRESS 2L INBOARD, 2R INBOARD SWITCHLIGHTS.
IF PROBLEM PERSISTS, TROUBLE IS IN INBOARD TANK.
IF PROBLEM GOES AWAY, TROUBLE IS IN OUTBOARD TANK.
USING SIGHT GAGES DETERMINE TOTAL AMOUNT OF FUEL IN TANK (MM12-11-03).
USE ACTUAL AND INDICATED FUEL QUANTITIES AND FIG. 103, SHEETS 4 AND 5 TO DETERMINE OPEN-CIRCUITED PROBE. 1
REPLACE PROBE (MM28-41-01).
DOES GAGE READ CORRECTLY?
3 USING SIGHT GAGES DETERMINE AMOUNT OF FUEL IN TANK (MM12-11-03).
USE ACTUAL AND INDICATED FUEL QUANTITIES AND FIG. 103, SHEET 3 TO DETERMINE OPEN-CIRCUITED PROBE. 1
REPLACE PROBE (MM28-41-01).
DOES GAGE READ CORRECTLY?
YES
4 REJECT PROBE.
NO
5 WARNING
DO NOT USE OHMETER FOR CONTINUITY CHECKS IN TANK UNLESS TANK HAS BEEN PURGED (MM28-11-00).
CHECK CONTINUITY OF HI-Z AND LO-Z WIRING. REPAIR AS NECESSARY (MM20-11-16).
NO
YES
6 REJECT PROBE.

1 NOTE

IF STICK BOTTOMS OUT USE PROCEDURE IN MM28-41-00, ADJUSTMENT AND TEST, AND TABLE 102 TO DETERMINE OPEN-CIRCUITED PROBE OR ADD ENOUGH FUEL (MM12-11-11) TO READ ON STICK.

M1-0002-28-737

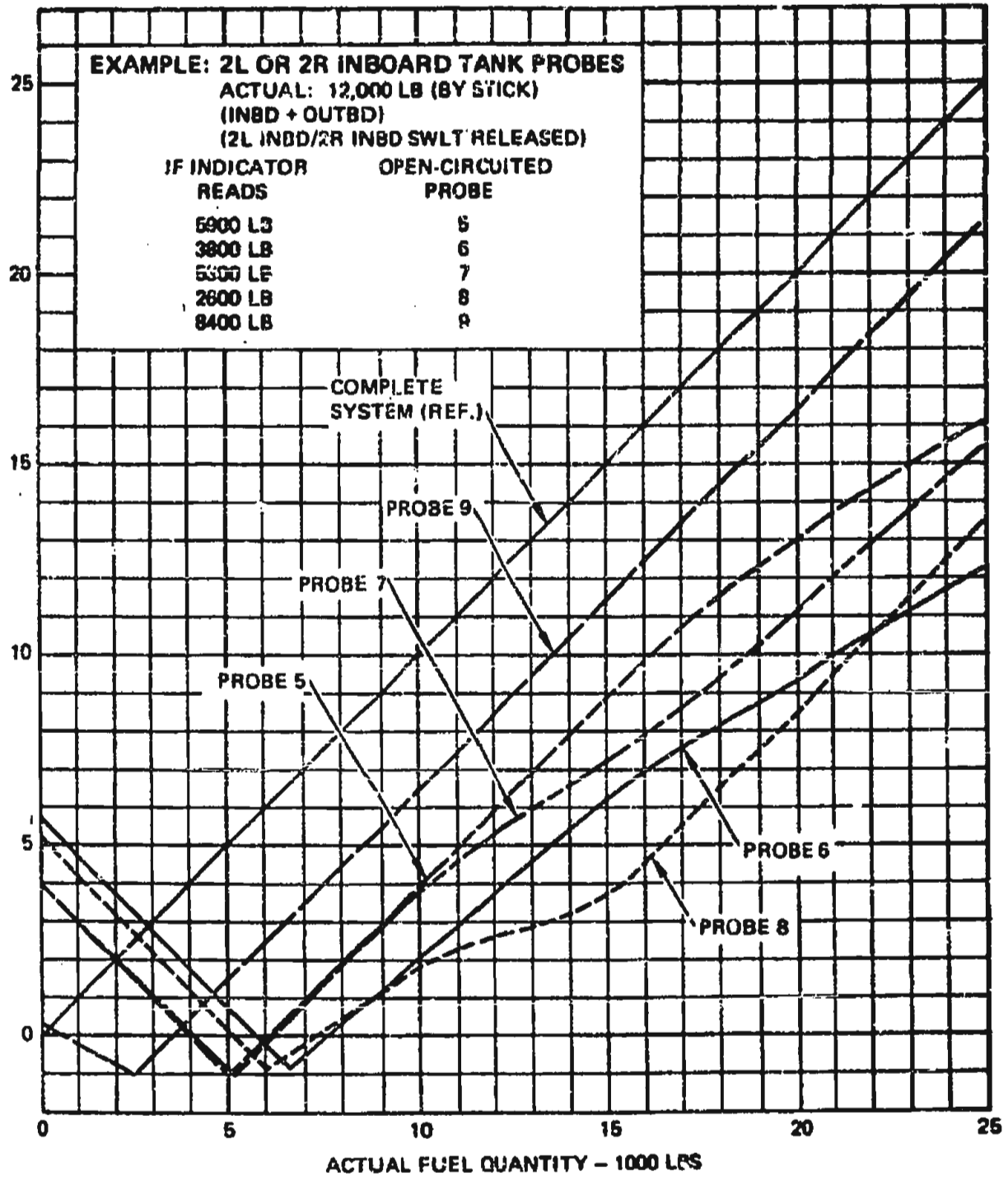
R Fuel Quantity Indicators Incorrect
R Figure 103 (Sheet 2)



M1-0000-28-738

R Fuel Quantity Indicators Incorrect
R Figure 103 (Sheet 3)

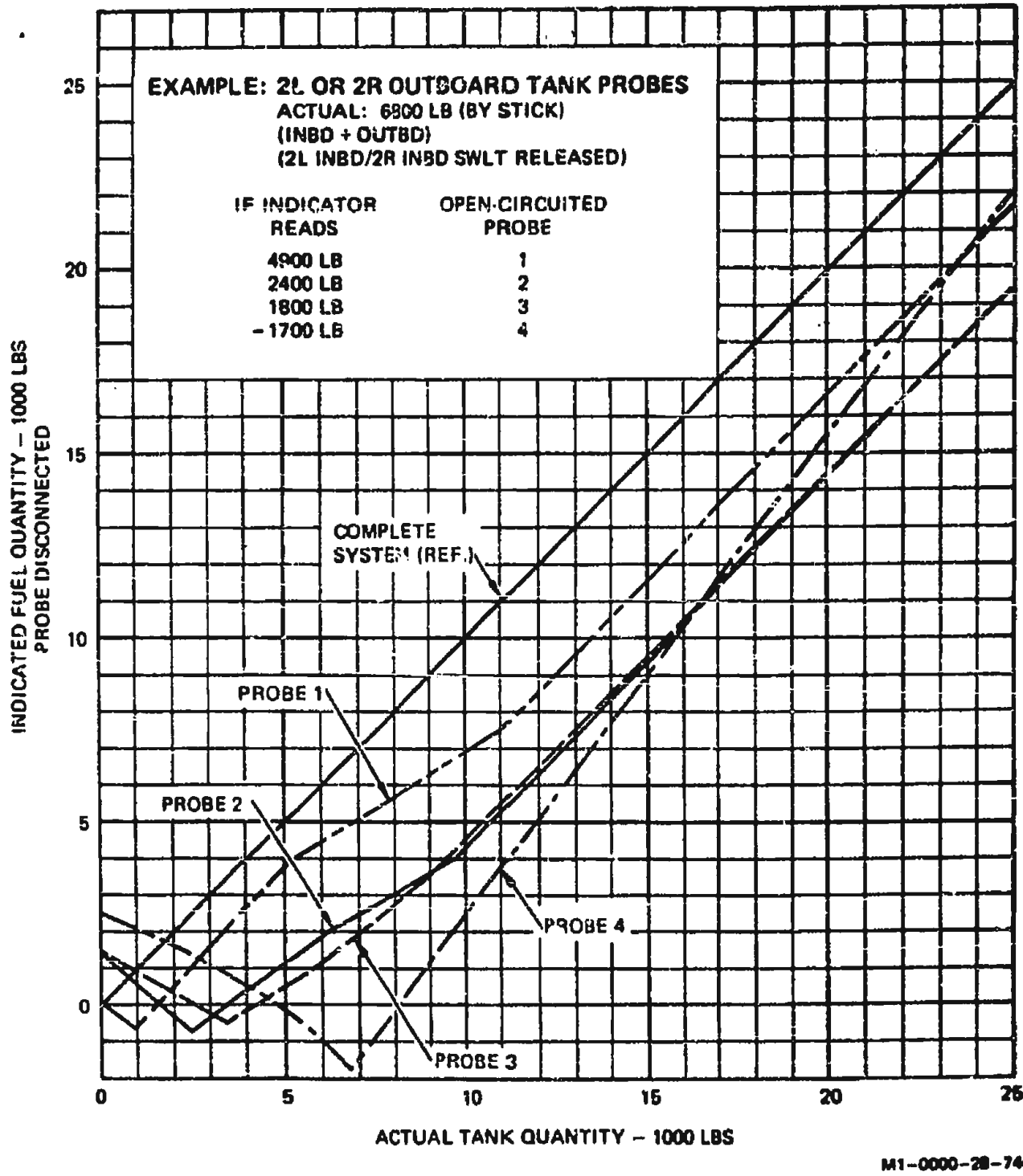
EFFECTIVITY: 001-024, 027



M1-0000-28-739

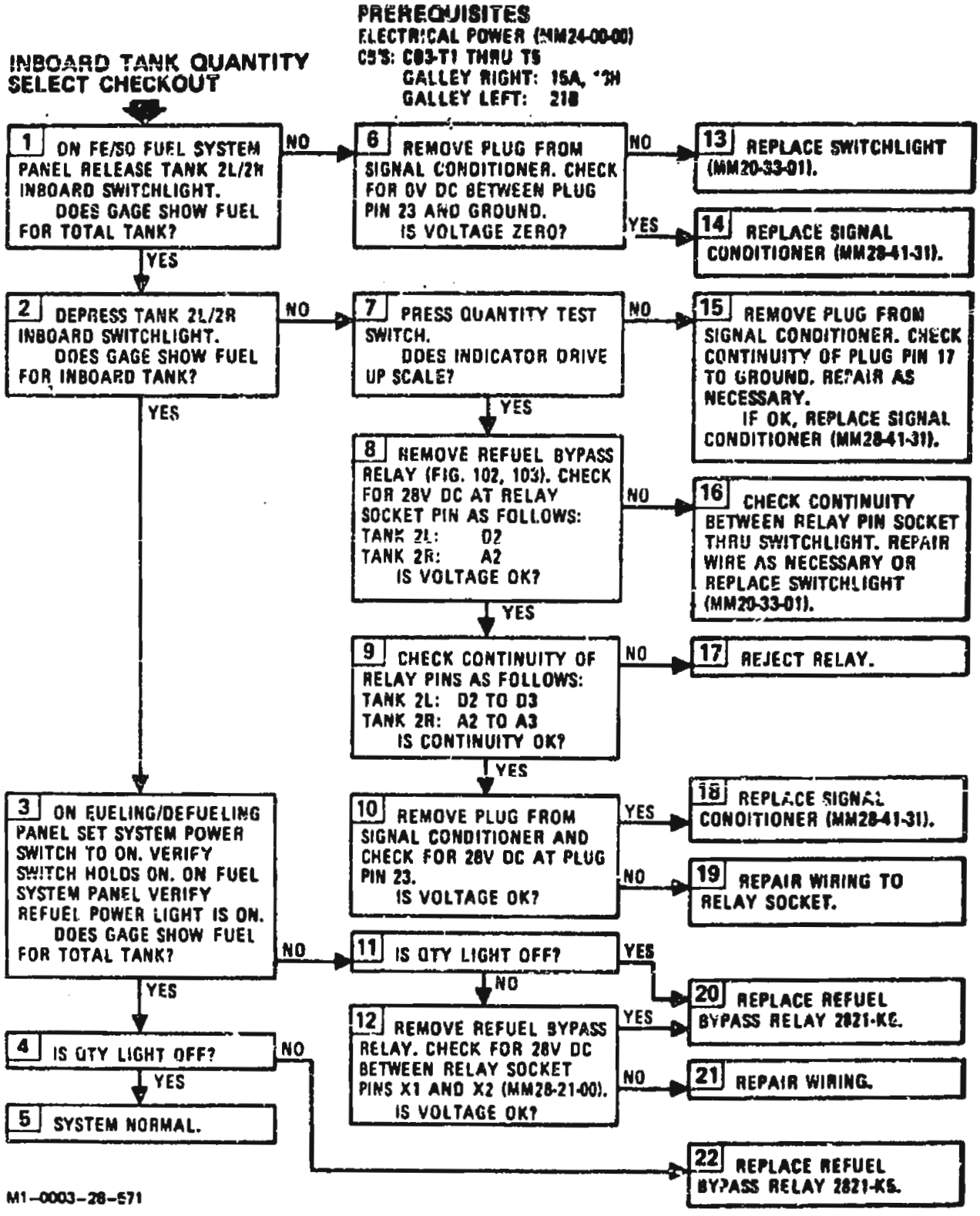
R Fuel Quantity Indicators Incorrect
R Figure 103 (Sheet 4)

EFFECTIVITY: 001-024, 027



R Fuel Quantity Indicators Incorrect
R Figure 103 (Sheet 5)

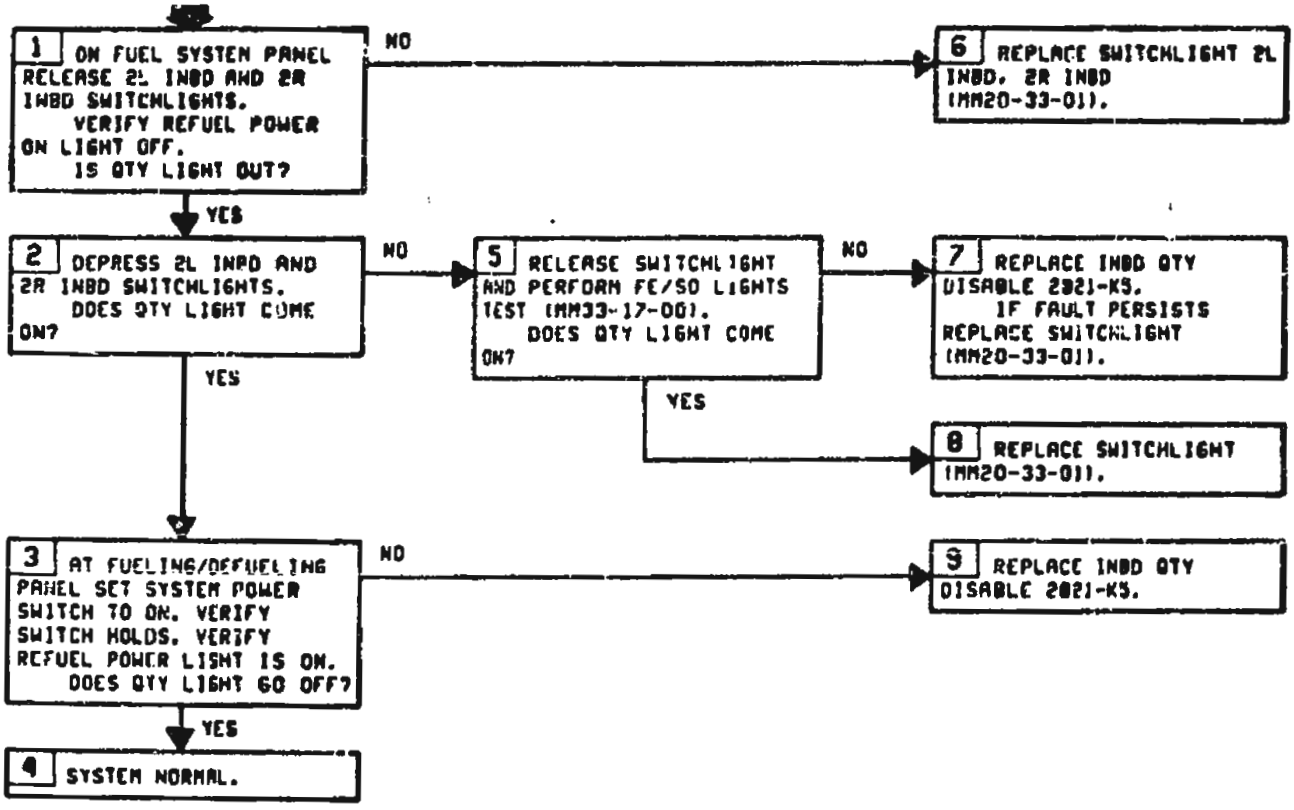
EFFECTIVITY: 001-024, 027


INBOARD TANK QUANTITY SELECT CHECKOUT
PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: C03-T1 THRU T5
GALLEY RIGHT: 15A, 2H
GALLEY LEFT: 21B
1 ON FE/SO FUEL SYSTEM PANEL RELEASE TANK 2L/2R INBOARD SWITCHLIGHT. DOES GAGE SHOW FUEL FOR TOTAL TANK?
NO
YES
2 DEPRESS TANK 2L/2R INBOARD SWITCHLIGHT. DOES GAGE SHOW FUEL FOR INBOARD TANK?
NO
YES
3 ON FUELING/DEFUELING PANEL SET SYSTEM POWER SWITCH TO ON. VERIFY SWITCH HOLDS ON. ON FUEL SYSTEM PANEL VERIFY REFUEL POWER LIGHT IS ON. DOES GAGE SHOW FUEL FOR TOTAL TANK?
NO
YES
4 IS QTY LIGHT OFF?
NO
YES
5 SYSTEM NORMAL.
6 REMOVE PLUG FROM SIGNAL CONDITIONER. CHECK FOR 0V DC BETWEEN PLUG PIN 23 AND GROUND. IS VOLTAGE ZERO?
NO
YES
13 REPLACE SWITCHLIGHT (MM20-33-01).
14 REPLACE SIGNAL CONDITIONER (MM28-41-31).
7 PRESS QUANTITY TEST SWITCH. DOES INDICATOR DRIVE UP SCALE?
NO
YES
15 REMOVE PLUG FROM SIGNAL CONDITIONER. CHECK CONTINUITY OF PLUG PIN 17 TO GROUND. REPAIR AS NECESSARY. IF OK, REPLACE SIGNAL CONDITIONER (MM28-41-31).
8 REMOVE REFUEL BYPASS RELAY (FIG. 102, 103). CHECK FOR 28V DC AT RELAY SOCKET PIN AS FOLLOWS: TANK 2L: D2 TANK 2R: A2 IS VOLTAGE OK?
NO
YES
16 CHECK CONTINUITY BETWEEN RELAY PIN SOCKET THRU SWITCHLIGHT. REPAIR WIRE AS NECESSARY OR REPLACE SWITCHLIGHT (MM20-33-01).
9 CHECK CONTINUITY OF RELAY PINS AS FOLLOWS: TANK 2L: D2 TO D3 TANK 2R: A2 TO A3 IS CONTINUITY OK?
NO
YES
17 REJECT RELAY.
10 REMOVE PLUG FROM SIGNAL CONDITIONER AND CHECK FOR 28V DC AT PLUG PIN 23. IS VOLTAGE OK?
YES
NO
18 REPLACE SIGNAL CONDITIONER (MM28-41-31).
19 REPAIR WIRING TO RELAY SOCKET.
11 IS QTY LIGHT OFF?
YES
NO
20 REPLACE REFUEL BYPASS RELAY 2821-K6.
12 REMOVE REFUEL BYPASS RELAY. CHECK FOR 28V DC BETWEEN RELAY SOCKET PINS X1 AND X2 (MM28-21-00). IS VOLTAGE OK?
YES
NO
21 REPAIR WIRING.
22 REPLACE REFUEL BYPASS RELAY 2821-K6.
M1-0003-28-571

R Inboard Tank QTY Select Checkout
R Figure 104

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: C82-K5, J6

QTY LIGHT CHECKOUT


1 ON FUEL SYSTEN PANEL RELEASE 2L INBD AND 2R INBD SWITCHLIGHTS. VERIFY REFUEL POWER ON LIGHT OFF. IS QTY LIGHT OUT?
NO
6 REPLACE SWITCHLIGHT 2L INBD, 2R INBD (MM20-33-01).
YES
2 DEPRESS 2L INBD AND 2R INBD SWITCHLIGHTS. DOES QTY LIGHT COME ON?
NO
5 RELEASE SWITCHLIGHT AND PERFORM FE/SO LIGHTS TEST (MM33-17-00). DOES QTY LIGHT COME ON?
NO
7 REPLACE INBD QTY DISABLE 2021-K5. IF FAULT PERSISTS REPLACE SWITCHLIGHT (MM20-33-01).
YES
8 REPLACE SWITCHLIGHT (MM20-33-01).
YES
3 AT FUELING/DEFUELING PANEL SET SYSTEM POWER SWITCH TO ON. VERIFY SWITCH HOLDS. VERIFY REFUEL POWER LIGHT IS ON. DOES QTY LIGHT GO OFF?
NO
9 REPLACE INBD QTY DISABLE 2021-K5.
YES
4 SYSTEM NORMAL.

M1-0603-80-576

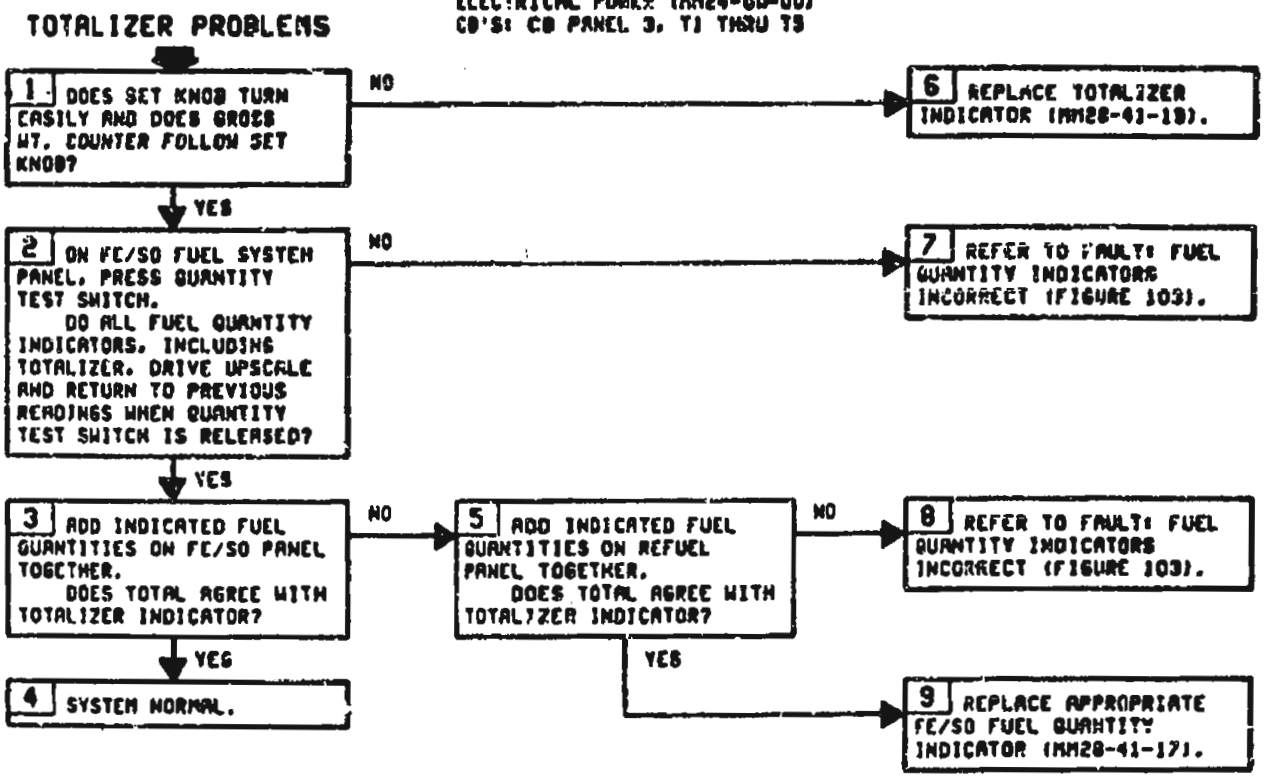
R
R

QTY Light Checkout
Figure 105

EFFECTIVITY: 001-024, 027

0018

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: CB PANEL 3, T1 THRU T5


TOTALIZER PROBLEMS
1 DOES SET KNOB TURN EASILY AND DOES GROSS WT. COUNTER FOLLOW SET KNOB?
NO
6 REPLACE TOTALIZER INDICATOR (MM28-41-19).
YES
2 ON FC/SO FUEL SYSTEM PANEL, PRESS QUANTITY TEST SWITCH.
DO ALL FUEL QUANTITY INDICATORS, INCLUDING TOTALIZER, DRIVE UPSCALE AND RETURN TO PREVIOUS READINGS WHEN QUANTITY TEST SWITCH IS RELEASED?
NO
7 REFER TO FAULT: FUEL QUANTITY INDICATORS INCORRECT (FIGURE 103).
YES
3 ADD INDICATED FUEL QUANTITIES ON FC/SO PANEL TOGETHER.
DOES TOTAL AGREE WITH TOTALIZER INDICATOR?
NO
5 ADD INDICATED FUEL QUANTITIES ON REFUEL PANEL TOGETHER.
DOES TOTAL AGREE WITH TOTALIZER INDICATOR?
NO
8 REFER TO FAULT: FUEL QUANTITY INDICATORS INCORRECT (FIGURE 103).
YES
4 SYSTEM NORMAL.
YES
9 REPLACE APPROPRIATE FC/SO FUEL QUANTITY INDICATOR (MM28-41-17).

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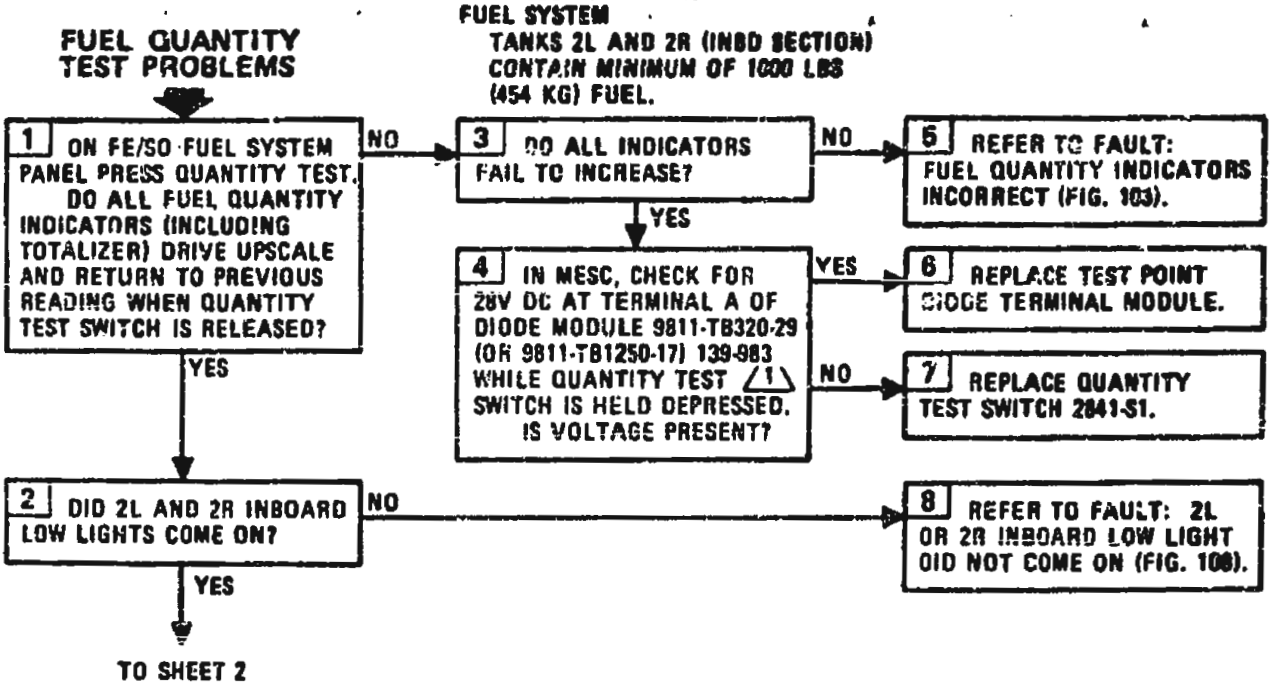
R
R

Totalizer Problems
Figure 106

EFFECTIVITY: 001-024, 027

0018

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: CB3-T; THRU T5
GALLEY RIGHT: A15, H16
GALLEY LEFT: B21
FUEL SYSTEM
TANKS 2L AND 2R (INBD SECTION) CONTAIN MINIMUM OF 1000 LBS (454 KG) FUEL.


FUEL QUANTITY TEST PROBLEMS
1 ON FE/SO FUEL SYSTEM PANEL PRESS QUANTITY TEST. DO ALL FUEL QUANTITY INDICATORS (INCLUDING TOTALIZER) DRIVE UPSCALE AND RETURN TO PREVIOUS READING WHEN QUANTITY TEST SWITCH IS RELEASED?
NO
YES
2 DID 2L AND 2R INBOARD LOW LIGHTS COME ON?
NO
YES
TO SHEET 2
3 DO ALL INDICATORS FAIL TO INCREASE?
NO
YES
4 IN MESC, CHECK FOR 28V DC AT TERMINAL A OF DIODE MODULE 9811-TB320-29 (OR 9811-TB1250-17) 139-983 WHILE QUANTITY TEST SWITCH IS HELD DEPRESSED. IS VOLTAGE PRESENT?
YES
NO
5 REFER TO FAULT: FUEL QUANTITY INDICATORS INCORRECT (FIG. 103).
6 REPLACE TEST POINT DIODE TERMINAL MODULE.
7 REPLACE QUANTITY TEST SWITCH 2841-S1.
8 REFER TO FAULT: 2L OR 2R INBOARD LOW LIGHT DID NOT COME ON (FIG. 108).

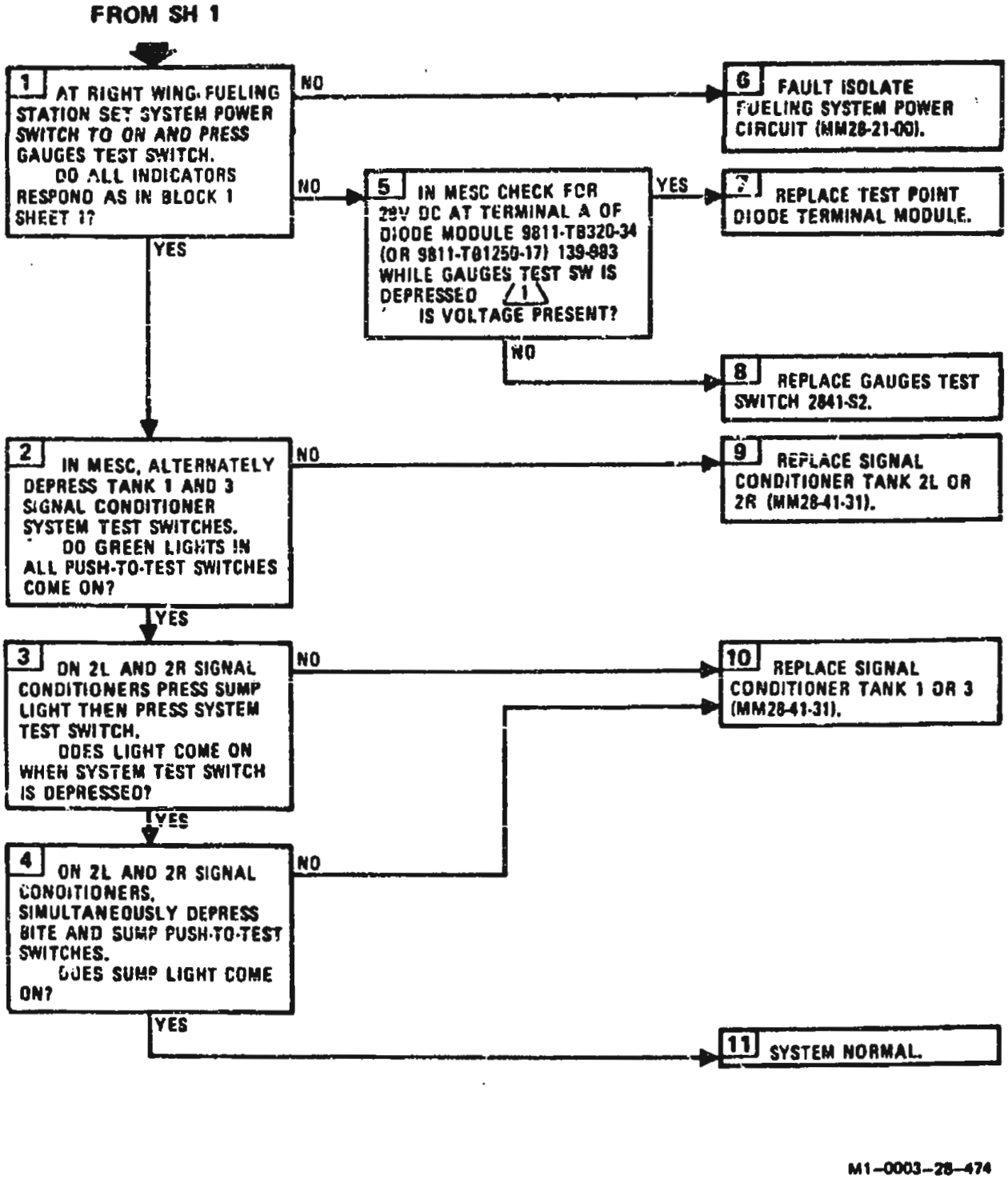
NOTE

⚠1 DIODE TERMINAL MODULES ARE SHOWN ON FUEL QUANTITY INDICATING SYSTEM SCHEMATIC, 28-41-00.

M1-0006-28-472

R
R

Fuel Quantity Test Problems
Figure 107 (Sheet 1)


FROM SH 1
1 AT RIGHT WING FUELING STATION SET SYSTEM POWER SWITCH TO ON AND PRESS GAUGES TEST SWITCH. DO ALL INDICATORS RESPOND AS IN BLOCK 1 SHEET 1?
NO
6 FAULT ISOLATE FUELING SYSTEM POWER CIRCUIT (MM28-21-00).
NO
5 IN MESC CHECK FOR 28V DC AT TERMINAL A OF DIODE MODULE 9811-TB320-34 (OR 9811-TB1250-17) 139-983 WHILE GAUGES TEST SW IS DEPRESSED (1) IS VOLTAGE PRESENT?
YES
7 REPLACE TEST POINT DIODE TERMINAL MODULE.
YES
NO
8 REPLACE GAUGES TEST SWITCH 2841-S2.
2 IN MESC, ALTERNATELY DEPRESS TANK 1 AND 3 SIGNAL CONDITIONER SYSTEM TEST SWITCHES. DO GREEN LIGHTS IN ALL PUSH-TO-TEST SWITCHES COME ON?
NO
9 REPLACE SIGNAL CONDITIONER TANK 2L OR 2R (MM28-41-31).
YES
3 ON 2L AND 2R SIGNAL CONDITIONERS PRESS SUMP LIGHT THEN PRESS SYSTEM TEST SWITCH. DOES LIGHT COME ON WHEN SYSTEM TEST SWITCH IS DEPRESSED?
NO
10 REPLACE SIGNAL CONDITIONER TANK 1 OR 3 (MM28-41-31).
YES
4 ON 2L AND 2R SIGNAL CONDITIONERS, SIMULTANEOUSLY DEPRESS BITE AND SUMP PUSH-TO-TEST SWITCHES. DOES SUMP LIGHT COME ON?
NO
YES
11 SYSTEM NORMAL.

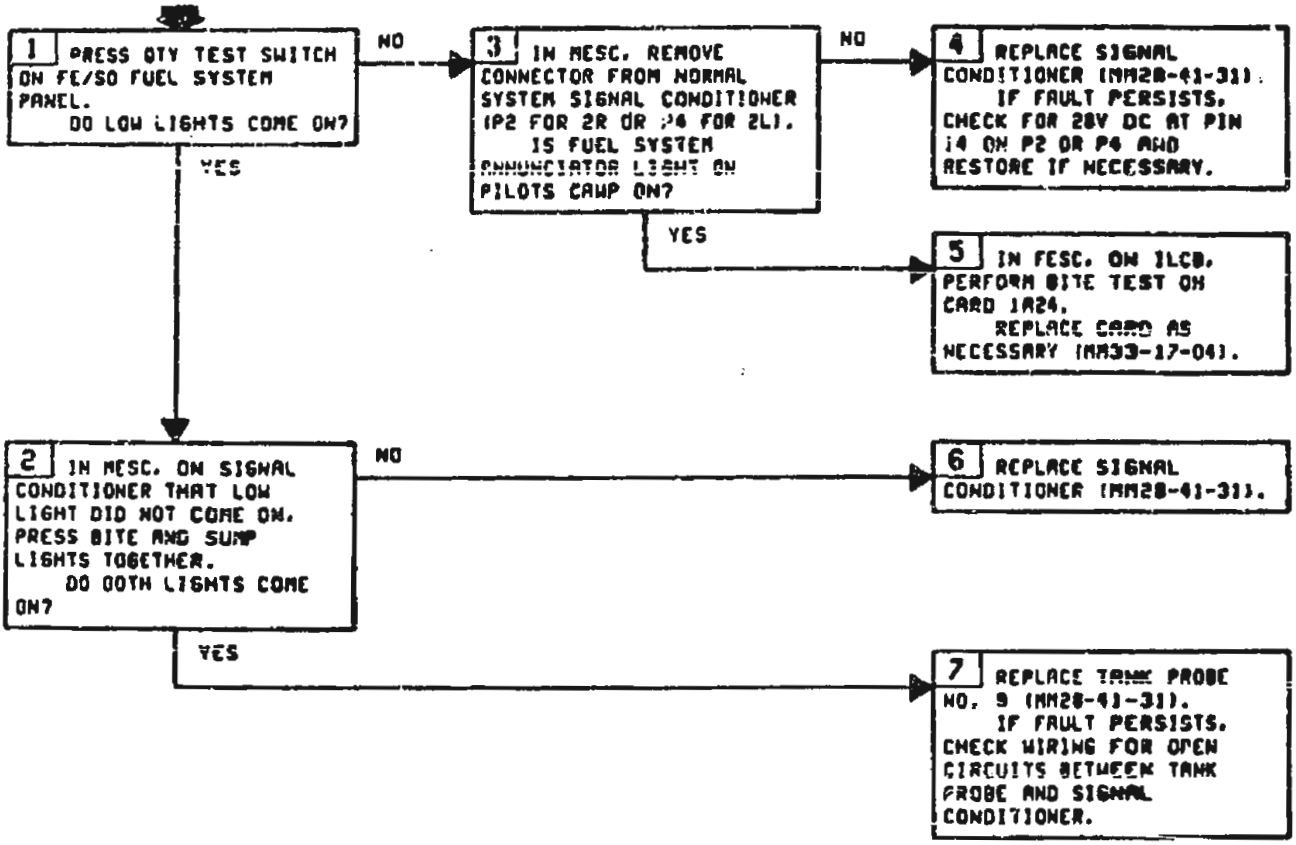
M1-0003-28-474

R Fuel Quantity Test Problems
R Figure 107 (Sheet 2)

EFFECTIVITY: 001-024, 027

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: C03-T1 THRU T5
FUEL SYSTEM PANEL:
REFUEL POWER SWITCHLIGHT PRESSED AND LIGHT OFF
FUEL QTY IN INBOARD TANKS LESS THAN 400 TO 1000 LBS
(182 TO 454KG) DEPENDING ON AIRCRAFT ATTITUDE
PANEL LAMP TEST

2L OR 2R LOW LIGHT DID NOT COME ON

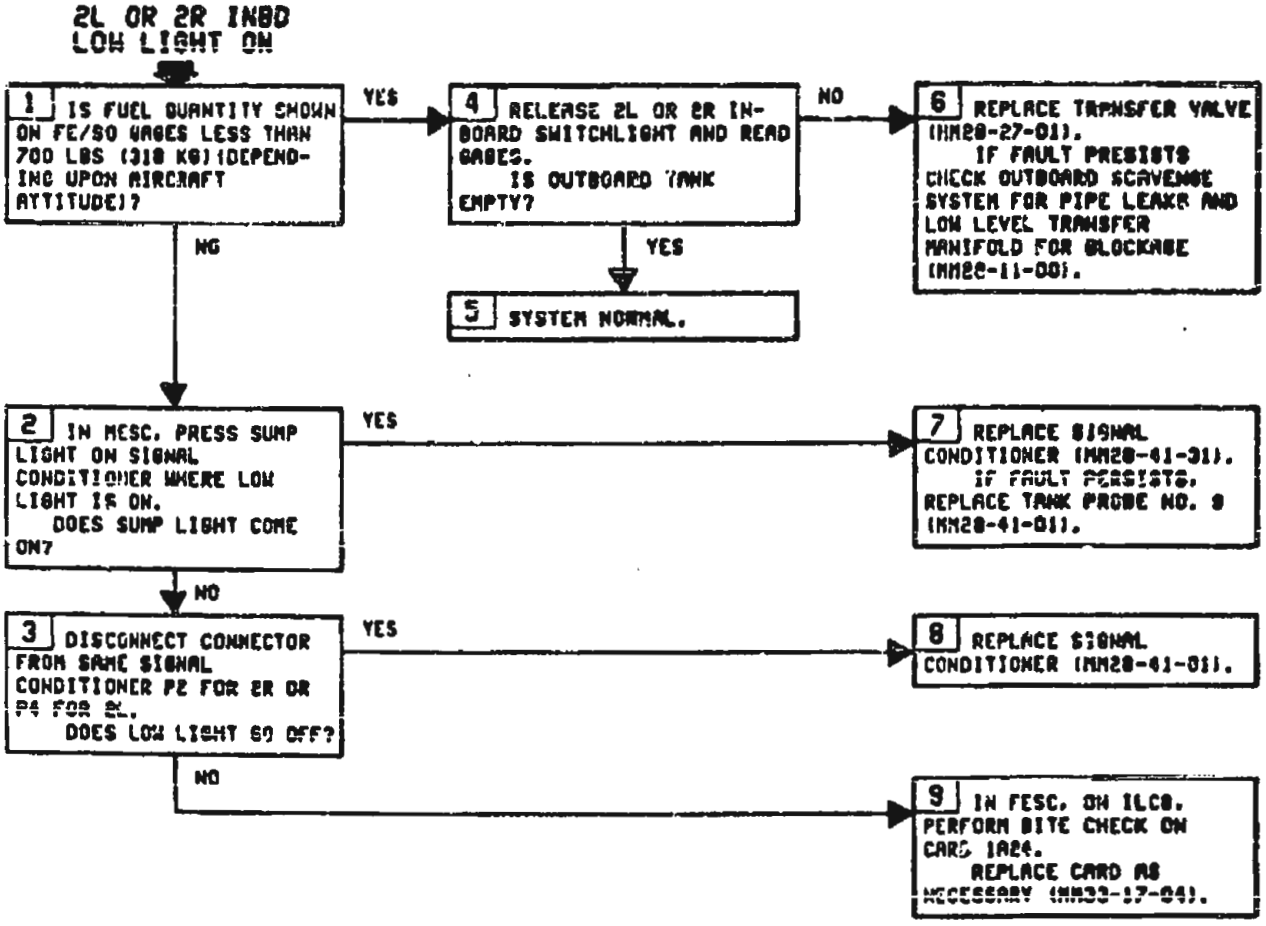

1 PRESS QTY TEST SWITCH ON FE/SO FUEL SYSTEM PANEL.
DO LOW LIGHTS COME ON?
NO
YES
3 IN MESC, REMOVE CONNECTOR FROM NORMAL SYSTEM SIGNAL CONDITIONER (P2 FOR 2R OR P4 FOR 2L).
IS FUEL SYSTEM ANNUNCIATOR LIGHT ON PILOTS CAMP ON?
NO
YES
4 REPLACE SIGNAL CONDITIONER (MM28-41-31).
IF FAULT PERSISTS, CHECK FOR 28V DC AT PIN 14 ON P2 OR P4 AND RESTORE IF NECESSARY.
5 IN FESC, ON ILCB, PERFORM BITE TEST ON CARD 1A24.
REPLACE CARD AS NECESSARY (MM33-17-04).
2 IN MESC, ON SIGNAL CONDITIONER THAT LOW LIGHT DID NOT COME ON, PRESS BITE AND SUMP LIGHTS TOGETHER.
DO BOTH LIGHTS COME ON?
NO
YES
6 REPLACE SIGNAL CONDITIONER (MM28-41-31).
7 REPLACE TANK PROBE NO. 9 (MM28-41-31).
IF FAULT PERSISTS, CHECK WIRING FOR OPEN CIRCUITS BETWEEN TANK PROBE AND SIGNAL CONDITIONER.

R1-0000-20-1600

R
R

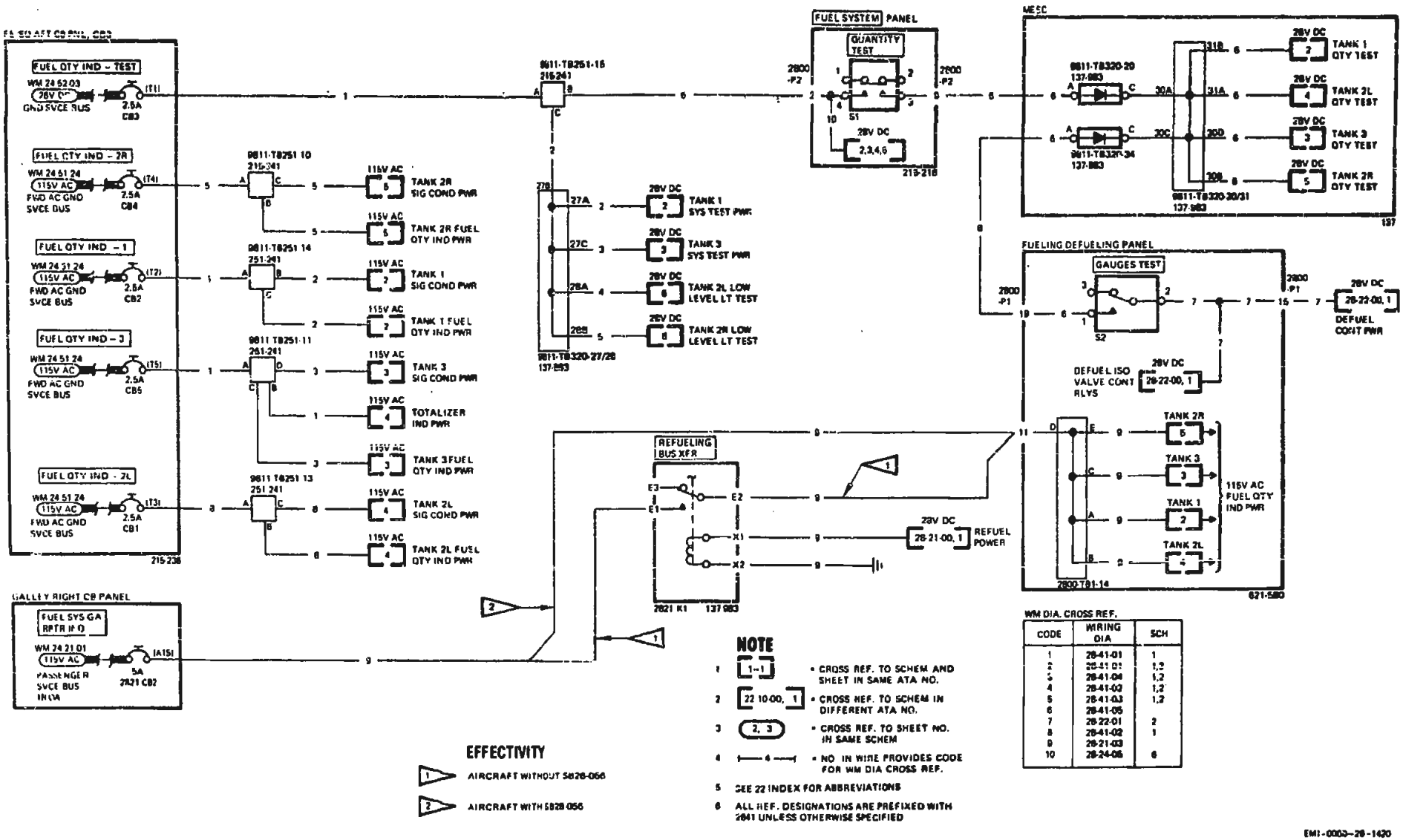
Tank 2L or 2R LOW Light Did Not Come On
Figure 108

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: CB3-71 THRU 74
FUEL SYSTEM PANEL:
2L AND 2R INBD SWITCHLIGHTS DEPRESSED
REFUEL POWER SWITCHLIGHT PRESSED AND ON LIGHT OFF.


2L OR 2R INBD LOW LIGHT ON
1 IS FUEL QUANTITY SHOWN ON FE/SO GAGES LESS THAN 700 LBS (318 KG) (DEPENDING UPON AIRCRAFT ATTITUDE)?
YES
4 RELEASE 2L OR 2R INBOARD SWITCHLIGHT AND READ GAGES.
IS OUTBOARD TANK EMPTY?
NO
6 REPLACE TRANSFER VALVE (MM28-27-01).
IF FAULT PERSISTS CHECK OUTBOARD SCAVENGE SYSTEM FOR PIPE LEAKS AND LOW LEVEL TRANSFER MANIFOLD FOR BLOCKAGE (MM28-11-00).
YES
5 SYSTEM NORMAL.
NO
2 IN MESC, PRESS SUMP LIGHT ON SIGNAL CONDITIONER WHERE LOW LIGHT IS ON.
DOES SUMP LIGHT COME ON?
YES
7 REPLACE SIGNAL CONDITIONER (MM28-41-31).
IF FAULT PERSISTS, REPLACE TANK PROBE NO. 8 (MM28-41-01).
NO
3 DISCONNECT CONNECTOR FROM SAME SIGNAL CONDITIONER P2 FOR 2R OR P4 FOR 2L.
DOES LOW LIGHT GO OFF?
YES
8 REPLACE SIGNAL CONDITIONER (MM28-41-01).
NO
9 IN FESC, ON ILCB, PERFORM BITE CHECK ON CARD 1A24.
REPLACE CARD AS NECESSARY (MM33-17-04).

AI-0001-28-1610

R 2L or 2R INBD LOW Light On
R Figure 109

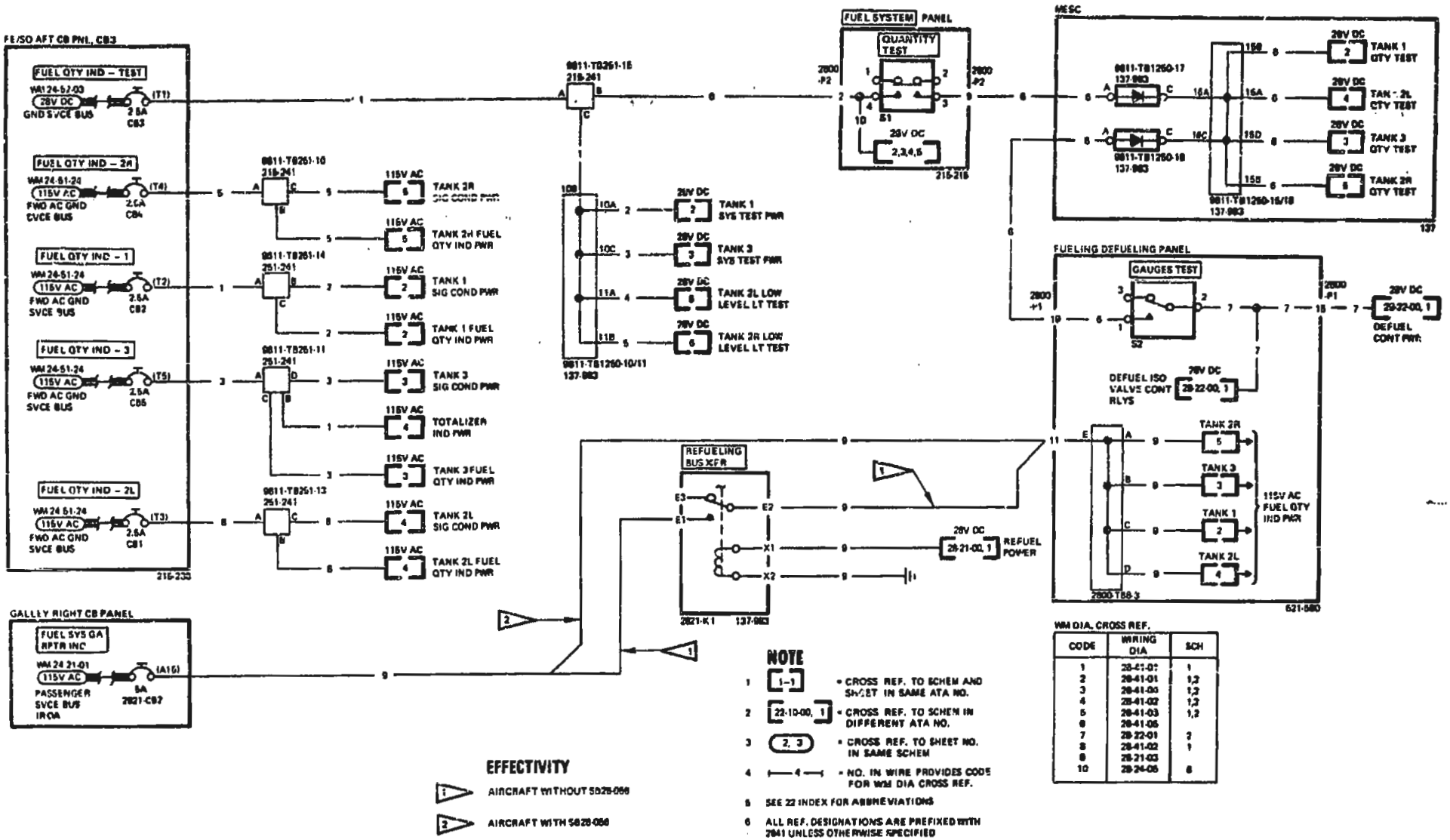

FUEL QTY IND – TEST
FUEL QTY IND – 2R
FUEL QTY IND – 1
FUEL QTY IND – 3
FUEL QTY IND – 2L
FUEL SYSTEM PANEL
QUANTITY TEST
MISC
FUELING DEFUELING PANEL
GAUGES TEST
REFUELING BUS XFR
GALLEY RIGHT CB PANEL
TANK 1 QTY TEST
TANK 2L QTY TEST
TANK 3 QTY TEST
TANK 2R QTY TEST
TANK 1 SYS TEST PWR
TANK 3 SYS TEST PWR
TANK 2L LOW LEVEL LT TEST
TANK 2R LOW LEVEL LT TEST
TANK 2R SIG COND PWR
TANK 2R FUEL QTY IND PWR
TANK 1 SIG COND PWR
TANK 1 FUEL QTY IND PWR
TANK 3 SIG COND PWR
TOTALIZER IND PWR
TANK 3 FUEL QTY IND PWR
TANK 2L SIG COND PWR
TANK 2L FUEL QTY IND PWR
DEFUEL ISO VALVE CONT RLYS
DEFUEL CONT PWR
REFUEL POWER
115V AC FUEL QTY IND PWR
NOTE
EFFECTIVITY
AIRCRAFT WITHOUT 5828-056
AIRCRAFT WITH 5828-056
WM DIA. CROSS REF.

CODE	WIRING DIA	SCH
1	28-41-01	1
2	28-41-01	1,2
3	28-41-04	1,2
4	28-41-02	1,2
5	28-41-03	1,2
6	28-41-05	
7	28-22-01	2
8	28-41-02	1
9	28-21-03	
10	28-24-06	6

EMI-0003-28-1420

Fuel Quantity Indicating System Power Distribution Schematic
SCHEM 1

R EFFECTIVITY: 001-023
R

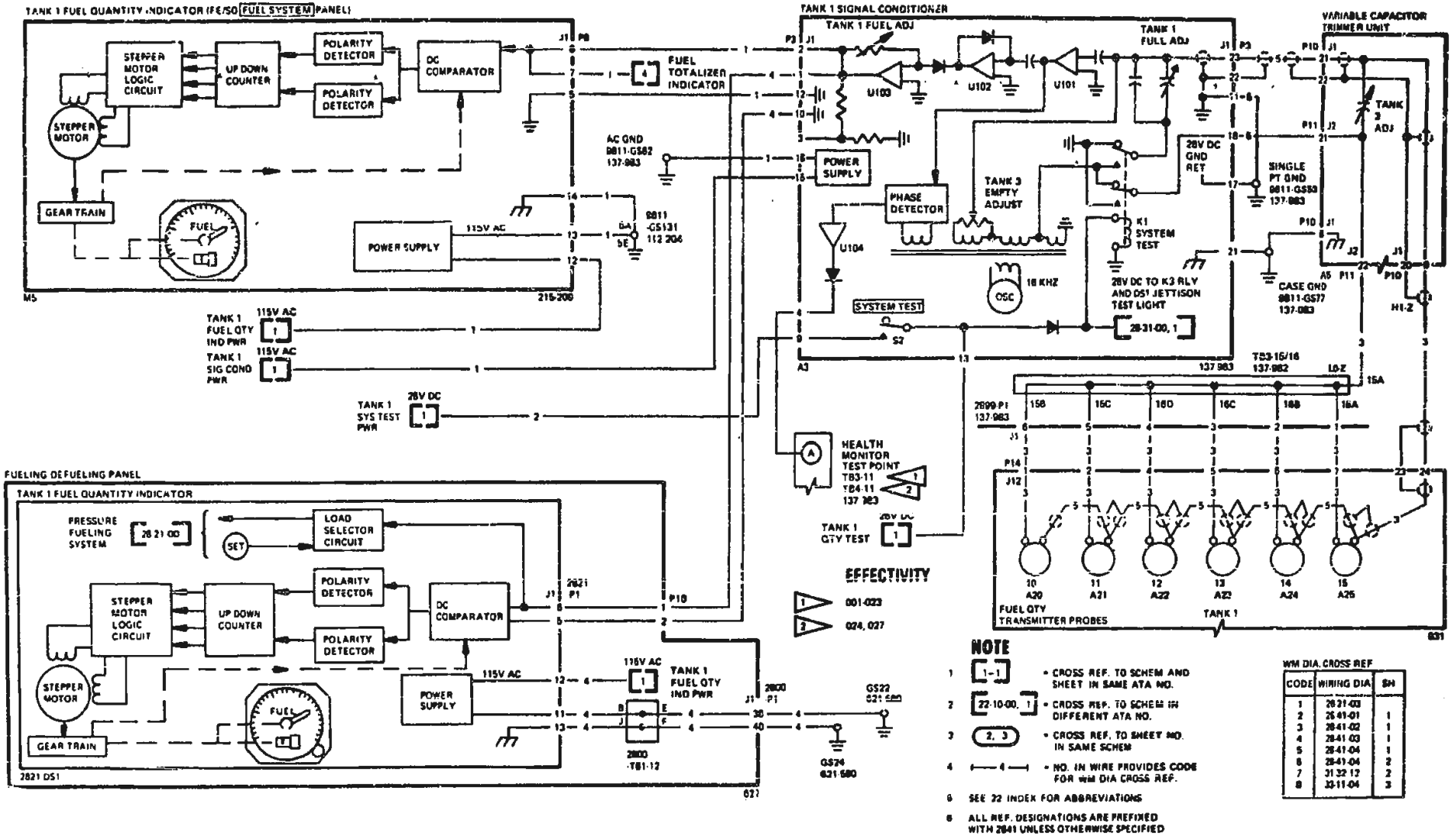

FE/SO AFT CB PNL, CB3
FUEL QTY IND – TEST
FUEL QTY IND – 2R
FUEL QTY IND – 1
FUEL QTY IND – 3
FUEL QTY IND – 2L
GALLEY RIGHT CB PANEL
FUEL SYS GA RPTR INC
FUEL SYSTEM PANEL
QUANTITY TEST
MISC
FUELING DEFUELING PANEL
GAUGES TEST
REFUELING BUS XFR
TANK 1 QTY TEST
TANK 2L QTY TEST
TANK 3 QTY TEST
TANK 2R QTY TEST
TANK 1 SYS TEST PWR
TANK 3 SYS TEST PWR
TANK 2L LOW LEVEL LT TEST
TANK 2R LOW LEVEL LT TEST
TANK 2R SIG COND PWR
TANK 2R FUEL QTY IND PWR
TANK 1 SIG COND PWR
TANK 1 FUEL QTY IND PWR
TANK 3 SIG COND PWR
TOTALIZER IND PWR
TANK 3 FUEL QTY IND PWR
TANK 2L SIG COND PWR
TANK 2L FUEL QTY IND PWR
DEFUEL CONT PWR
DEFUEL ISO VALVE CONT RLYS
REFUEL POWER
115V AC FUEL QTY IND PWR
NOTE
EFFECTIVITY
AIRCRAFT WITHOUT 5828-056
AIRCRAFT WITH 5828-056
WM DIA. CROSS REF.

CODE	WIRING DIA	SCH
1	28-41-01	1
2	28-41-01	1,2
3	28-41-00	1,2
4	28-41-02	1,2
5	28-41-03	1,2
6	28-41-05	
7	28-22-01	2
8	28-41-02	1
9	28-21-03	
10	28-24-05	6

EMI-0000-28-1421

R Fuel Quantity Indicating System Power Distribution
R SCHEM 1

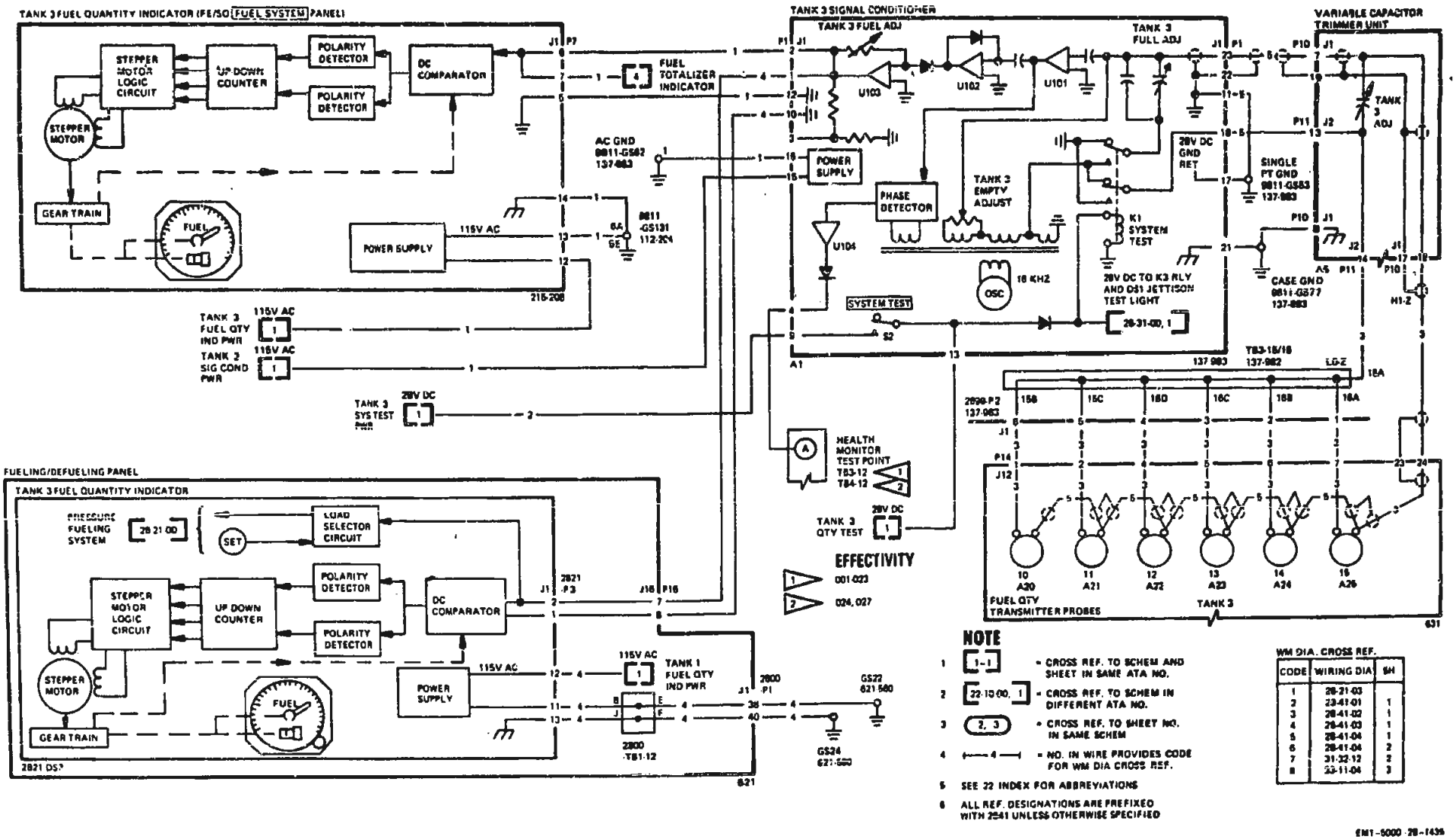
EFFECTIVITY: 024, 027



Tank 1 Fuel Quantity Indicating System Schematic
SCHEM 2

R R EFFECTIVITY: 001-024, 027

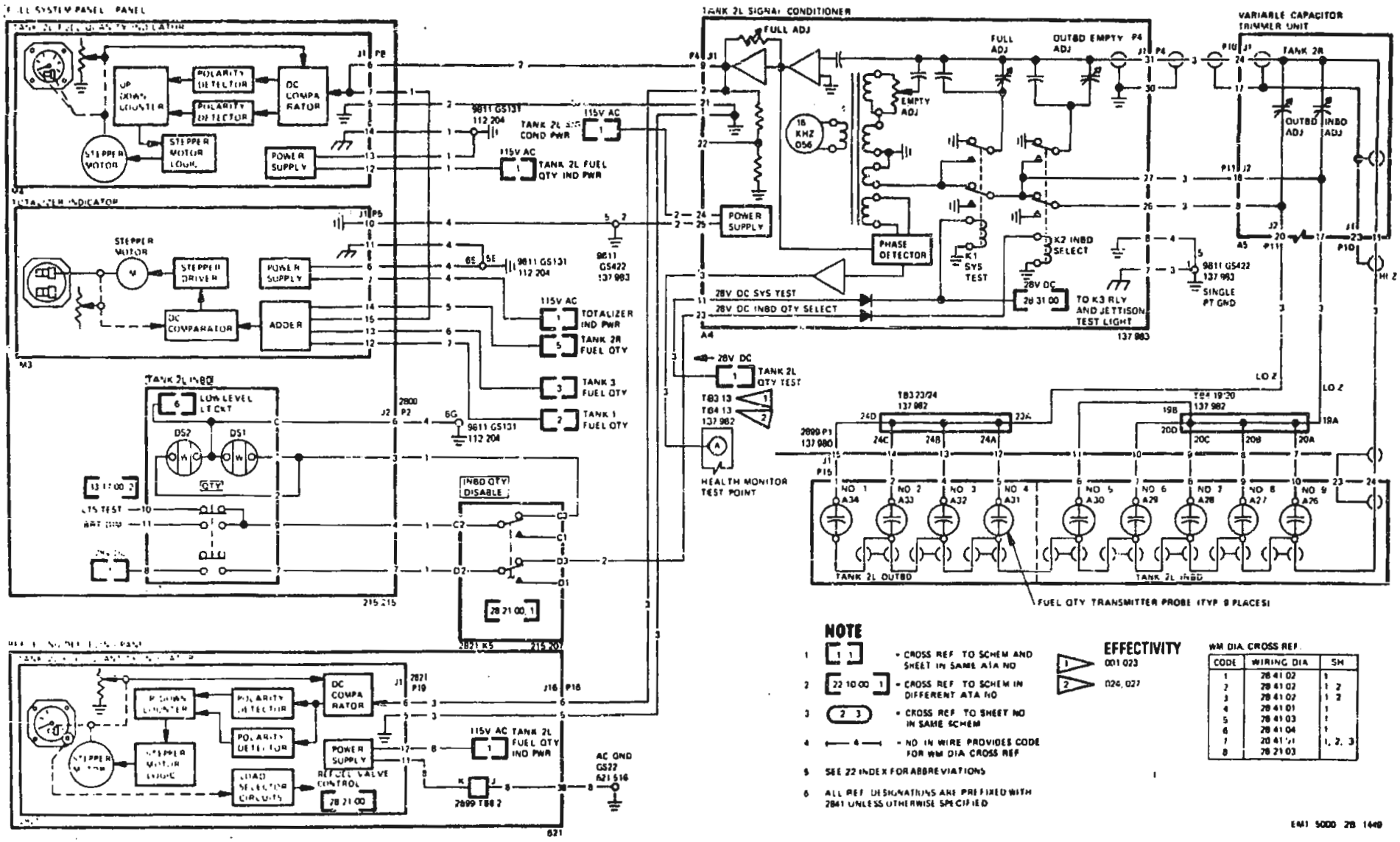
001B



Tank 3 Fuel Quantity Indicating System Schematic
SCHEM 3

R EFFECTIVITY: 001-024, 027
R

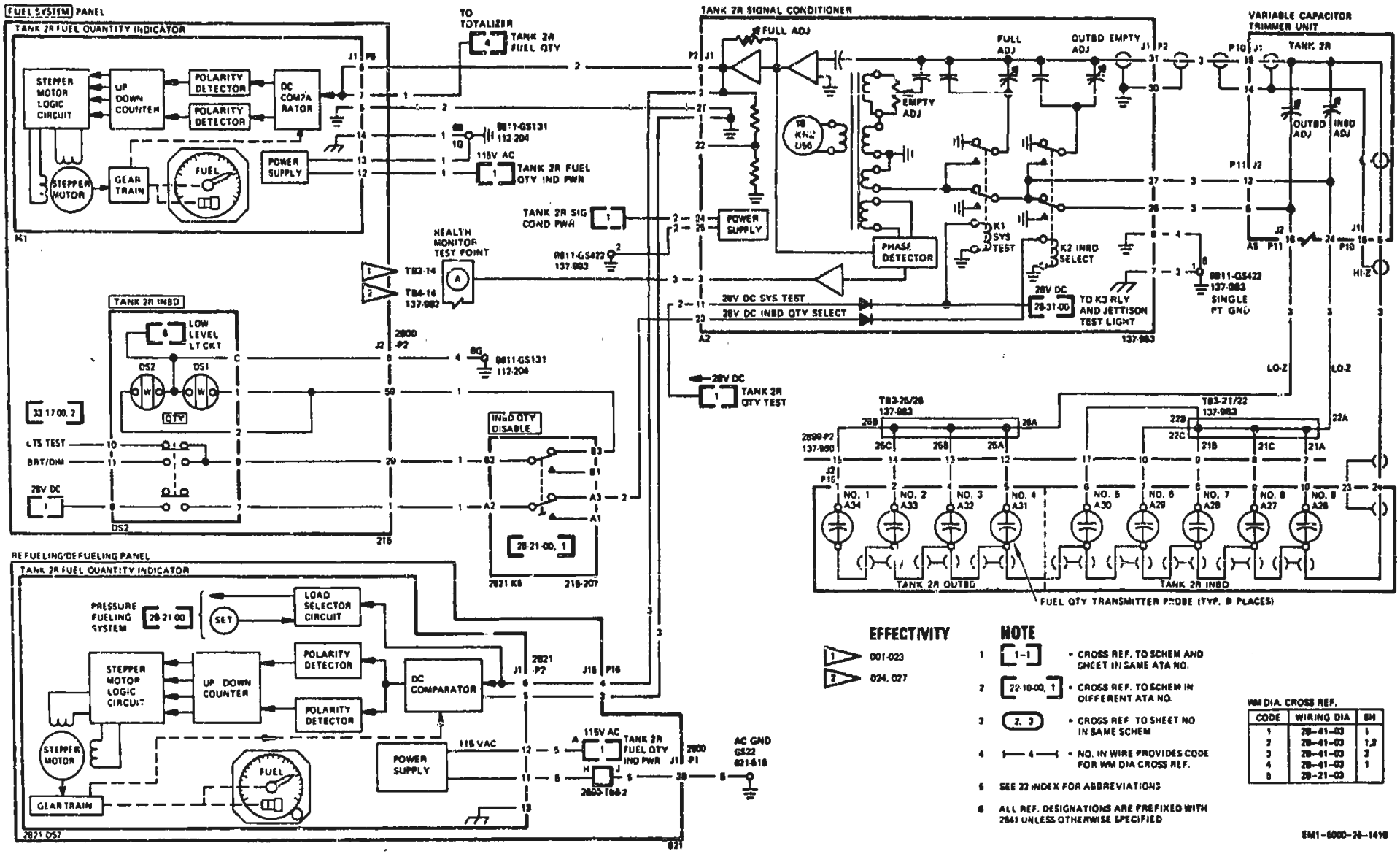
0018


TANK 2L SIGNAL CONDITIONER
VARIABLE CAPACITOR TRIMMER UNIT
TANK 2R
TOTALIZER INDICATOR
TANK 2L INBD
TANK 2L OUTBD
TANK 2L INBD
FUEL QTY TRANSMITTER PROBE (TYP 9 PLACES)
HEALTH MONITOR TEST POINT
TO K3 RLY AND JETTISON TEST LIGHT
28V DC SYS TEST
28V DC INBD QTY SELECT
TANK 2L QTY TEST
TOTALIZER IND PWR
TANK 2R FUEL QTY
TANK 3 FUEL QTY
TANK 1 FUEL QTY
TANK 2L FUEL QTY IND PWR
INBD QTY DISABLE
NOTE
EFFECTIVITY
001 023
024, 027
WM DIA CROSS REF.
CODE | WIRING DIA | SH
1 | 28 41 02 | 1
2 | 28 41 02 | 1 2
3 | 28 41 02 | 1 2
4 | 28 41 01 | 1
5 | 28 41 03 | 1
6 | 28 41 04 | 1
7 | 28 41 01 | 1, 2, 3
8 | 28 21 03 | 1

Tank 2L Fuel Quantity Indicating System Schematic
SCHEM 4

R EFFECTIVITY: 001-024, 027
R

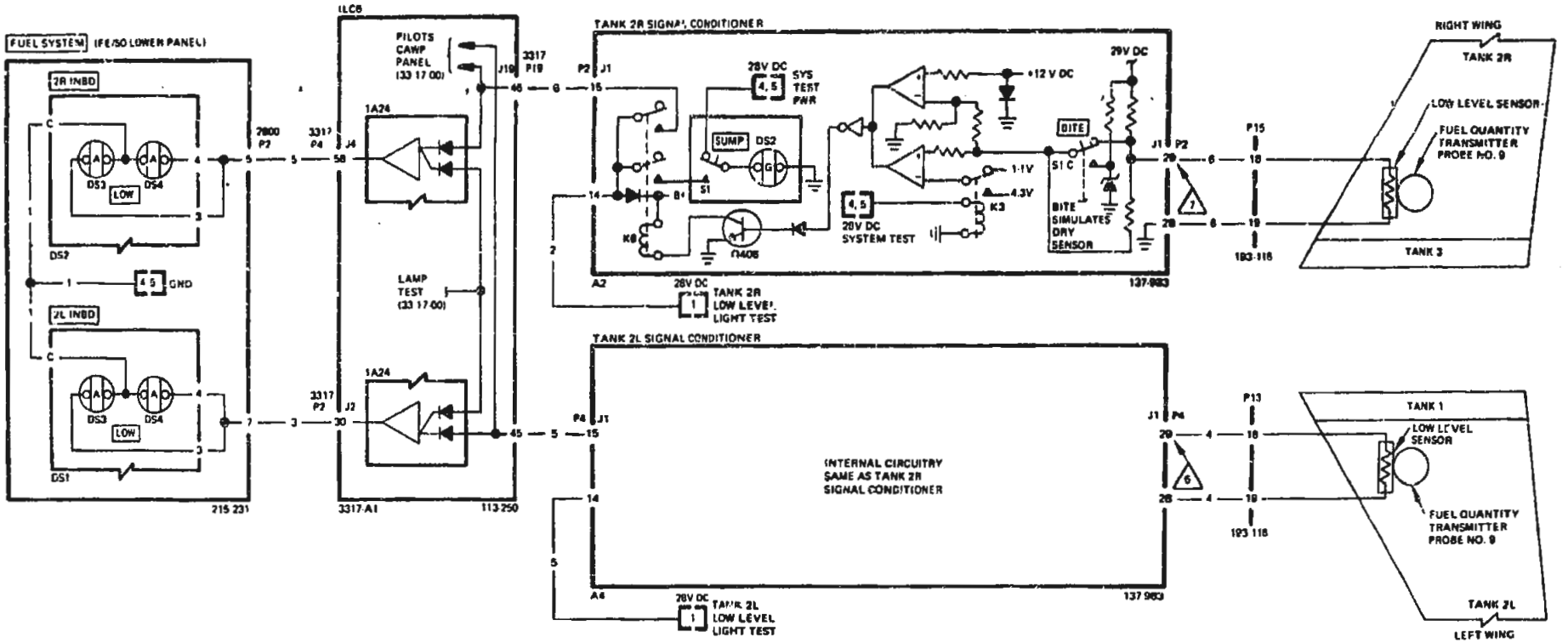
001B



Tank 2R Fuel Quantity Indicating System Schematic
SCHEM 5

R EFFECTIVITY: 001-024, 027
R

0018



NOTE

1. [1-1] • CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2. [22 10 00 1] • CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3. (2, 3) • CROSS REF. TO SHEET NO. IN SAME SCHEM
4. —4— • NO. IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.
5. SEE 22 ABBR FOR ABBREVIATIONS
6. ALL REF. DESIGNATIONS ARE PREFIXED WITH 28A1 UNLESS OTHERWISE SPECIFIED
7. REF. 5828 051 115 PIN 20, WAS PIN 18)

WM DIA CROSS REF.

CODE	WIRING DIA	SH
1	28 24 05	4
2	28 41 01	2
3	28 41 02	1
4	28 41 02	2
5	28 41 03	1
6	28 41 03	2

EMI 0000-28-1482

Tank 2L/2R Low Fuel Level Indicating System Schematic
SCHEM 6

R R EFFECTIVITY: 001-024, 027

0018

FUEL QUANTITY INDICATING SYSTEM - FAULT ISOLATION

1. General

Reference data and fault isolation procedures for troubleshooting fuel quantity indicating system faults are included in this section of the manual. A fuel quantity indicating system malfunction detected by the flight crew is normally entered in the aircraft flight log book and reported to maintenance personnel by a FIRM fault code number. This number and the flight log book write-up can be found in the Chapter 28 Fault Code Index. The index specifies the maintenance manual section, fault isolation diagram figure number and, where appropriate, a block number indicating the diagram entry point containing the fault isolation procedure. When no block number is specified, the diagram entry point is block 1.

Prerequisites listed at the top of each diagram identify mandatory preliminary steps and circuit breakers that must be closed before initiating any fault isolation step.

Schematic diagrams, identified by a SCHEM number, supplement fault isolation procedures as maintenance aids. The schematics show the basic system circuitry necessary for troubleshooting and include cross-reference indexes to the wiring diagram manual pages required for checking component interconnect wiring.

2. Supplemental data

Supplementary data includes functional tests, checkout tests, BITE checks and other general information that can be helpful in performing fault isolation. Supplementary data in this section is listed in Table 101.

Supplemental Data
Table 101

TABLE FIGURE NO.	TITLE
Table 102	Fuel Quantity Transmitter Probe Capacitance

Fuel Quantity Transmitter Probe Capacitance
Table 102

	PROBE LOCATION	PROBE NO.	CAPACITANCE (pf)	
			DRY PROBE	WET PROBE
	TANK 2L & 2R (OUTBD)	1	16.3 (±0.50)	16.3 (±0.75)
	TANK 2L & 2R (OUTBD)	2	25.7 (±0.50)	25.7 (±0.75)
	TANK 2L & 2R (OUTBD)	3	25.9 (±0.50)	25.9 (±0.75)
CR	TANK 2L & 2R (OUTBD)	4	34.8 (±0.50)	34.8 (±0.75)*
	TANK 2L & 2R (INBD)	5	44.1 (±0.50)	44.1 (±0.69)
	TANK 2L & 2R (INBD)	6	57.4 (±0.60)	57.4 (±0.83)
	TANK 2L & 2R (INBD)	7	44.4 (±0.50)	44.4 (±0.69)
CR	TANK 2L & 2R (INBD)	8	53.2 (±0.53)	53.2 (±0.73)*
CR	TANK 2L & 2R (INBD)	9	17.8 (±0.50)	17.8 (±0.69)*
	TANK 1 & 3	10	62.5 (±0.60)	62.5 (±0.80)
	TANK 1 & 3	11	81.3 (±0.80)	81.3 (±1.08)
	TANK 1 & 3	12	100.3 (±1.00)	100.3 (±1.34)
	TANK 1 & 3	13	81.8 (±0.80)	81.8 (±1.07)
CR	TANK 1 & 3	14	45.9 (±0.50)	45.9 (±0.67)*
CR CR	TANK 1 & 3	15	147.2 (±1.50)	147.2 (±2.04)*
	TANK 1A & 3A	16	44.5 (±0.67)	44.5 (±0.87)
	TANK 1A & 3A	17	48.2 (±0.67)	48.2 (±0.87)

NOTE: A dry probe is one in an empty tank that has been purged. A wet probe is one in an empty tank that has not been purged and the probe plates are still wet with fuel.

CR CR *If probes are out of tolerance high - insure probe is above tank fuel level.

3. Fault Isolation

Table 103 is a list of fault isolation data in this section of the manual.

Fault Isolation Data
Table 103

FIGURE	TITLE
101	Component Location Index
102	Components Locator
103	Fuel Quantity Gages Incorrect
104	Inboard Tank QTY Select Problems
105	QTY Light Problems
106	Totalizer Problems
107	Fuel Quantity Test Problems
108	Low Light Did Not Come On
109	Tank 2L or 2R INBD LOW Light On
110	Tank 1A or 3A LOW Light On
SCHEM 1	Fuel Quantity Indicating System Power Distribution Schematic
SCHEM 2	Tank 1/1A Fuel Quantity Indicating System Schematic
SCHEM 3	Tank 3/3A Fuel Quantity Indicating System Schematic
SCHEM 4	Tank 2L Fuel Quantity Indicating System Schematic
SCHEM 5	Tank 2R Fuel Quantity Indicating System Schematic
SCHEM 6	Tank 2L/2L Low Level Fuel Indicating System Schematic

COMPONENT	QTY	AREA/ACCESS	REFERENCE
CIRCUIT BREAKERS:			
FUEL QTY IND – TEST 2841 – CB3	1	FLT STA/CB3 T1	*
FUEL QTY IND – 1 & 1A 2841 – CB2	1	FLT STA/CB3 T2	*
FUEL QTY IND – 2L 2841 – CB1	1	FLT STA/CB3 T3	*
FUEL QTY IND – 2R 2841 – CB4	1	FLT STA/CB3 T4	*
FUEL QTY IND – 3 & 3A 2841 – CB5	1	FLT STA/CB3 T5	*
FUEL SYS RPTR IND 2841 – CB2	1	GALLEY RT CB PNL/A15	*
CONDITIONER, SIGNAL	4	MESC/192K, 137AZ	28-41-30/31
GAGE, FUEL LEVEL SIGHT – TK1, 3, 2L, 2R	12	WING TANK UPPER SURFACE	28-41-24
GAGE, FUEL LEVEL SIGHT – TANK 1A&3A	2	CTR SECT – LWR FUSE FAIRING	28-41-38
INDICATORS, FUEL QTY:			
TANK 2L/2R	2	FUELING/DEFUELING PNL	28-41-17
TANK 1/3	2	FUELING/DEFUELING PNL	28-41-17
TANK 2L/2R	2	FE/SO PNL FLT STA	28-41-20
TANK 1/3	2	FE/SO PNL FLT STA	28-41-21
TOTALIZER	1	FE/SO PNL FLT STA	28-41-19
PANEL:			
FE/SO FUEL SYSTEM	1	FE/SO CONSOLE – FLT STA	28-00-10
FUELING/DEFUELING PANEL	1	RT WING LE, 621FB	28-21-19
PROBE, FUEL QTY XMTR 1, 2L, 2R, 3	30	WING TANK UPPER SURFACE	28-41-01
PROBE, FUEL QTY XMTR 1A/3A	4	TANK 1A/3A INTERIOR	28-41-34
RELAYS:			
REFUEL BYPASS NO. 1 (2825 – K5)	1	FE/SO RLY PNL, FLT STA	*
REFUEL BYPASS NO. 2 (2899 – K13)	1	FE/SO RLY PNL, FLT STA	*
REFUELING BUS XFR (2821 – K1)	1	MESC/137MZ, 131AR	*
SWITCH:			
2L INBD QTY	1	FE/SO FUEL SYS PNL	*
2R INBD QTY	1	FE/SO FUEL SYS PNL	*
TANK 1A QTY	1	FE/SO FUEL SYS PNL	*
TANK 3A QTY	1	FE/SO FUEL SYS PNL	*
UNIT, VARIABLE CAPACITANCE TRIMMER	1	MESC/192K, 137AZ	28-41-16

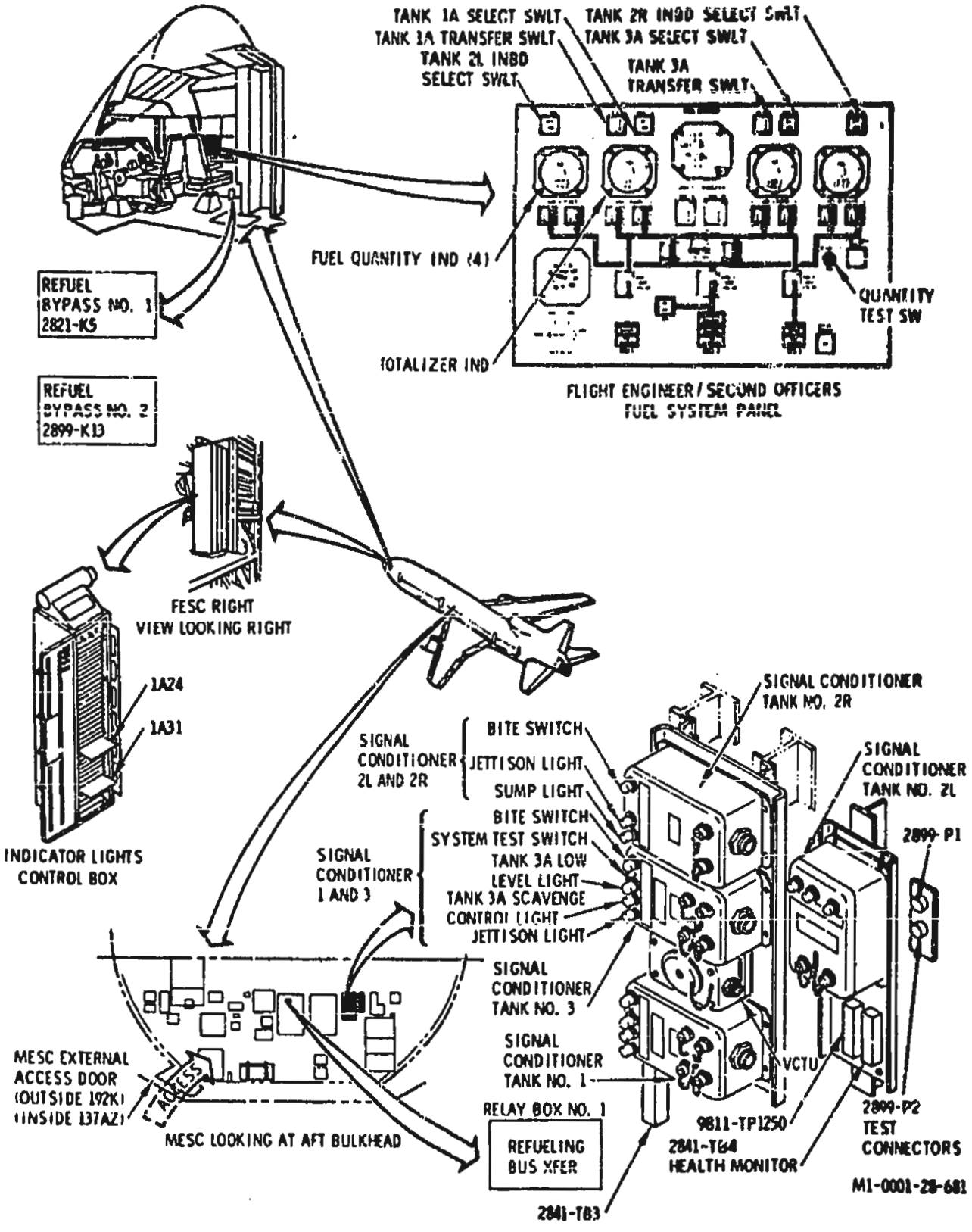
*SEE WM EQUIPMENT LIST

M1-0000-28-1480

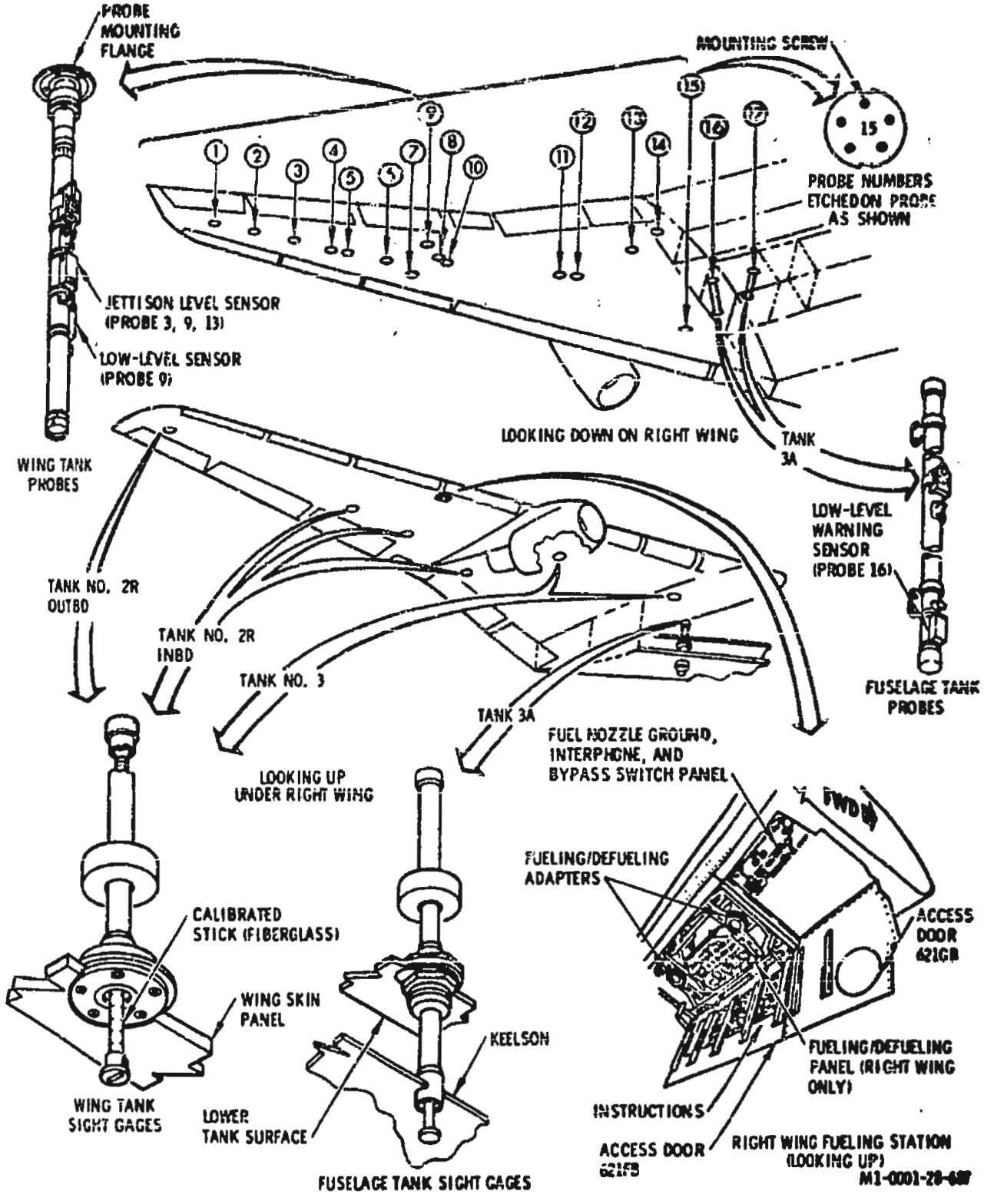
Component Location Index
Figure 101

R EFFECTIVITY: 025-026, 028-999
R

0028

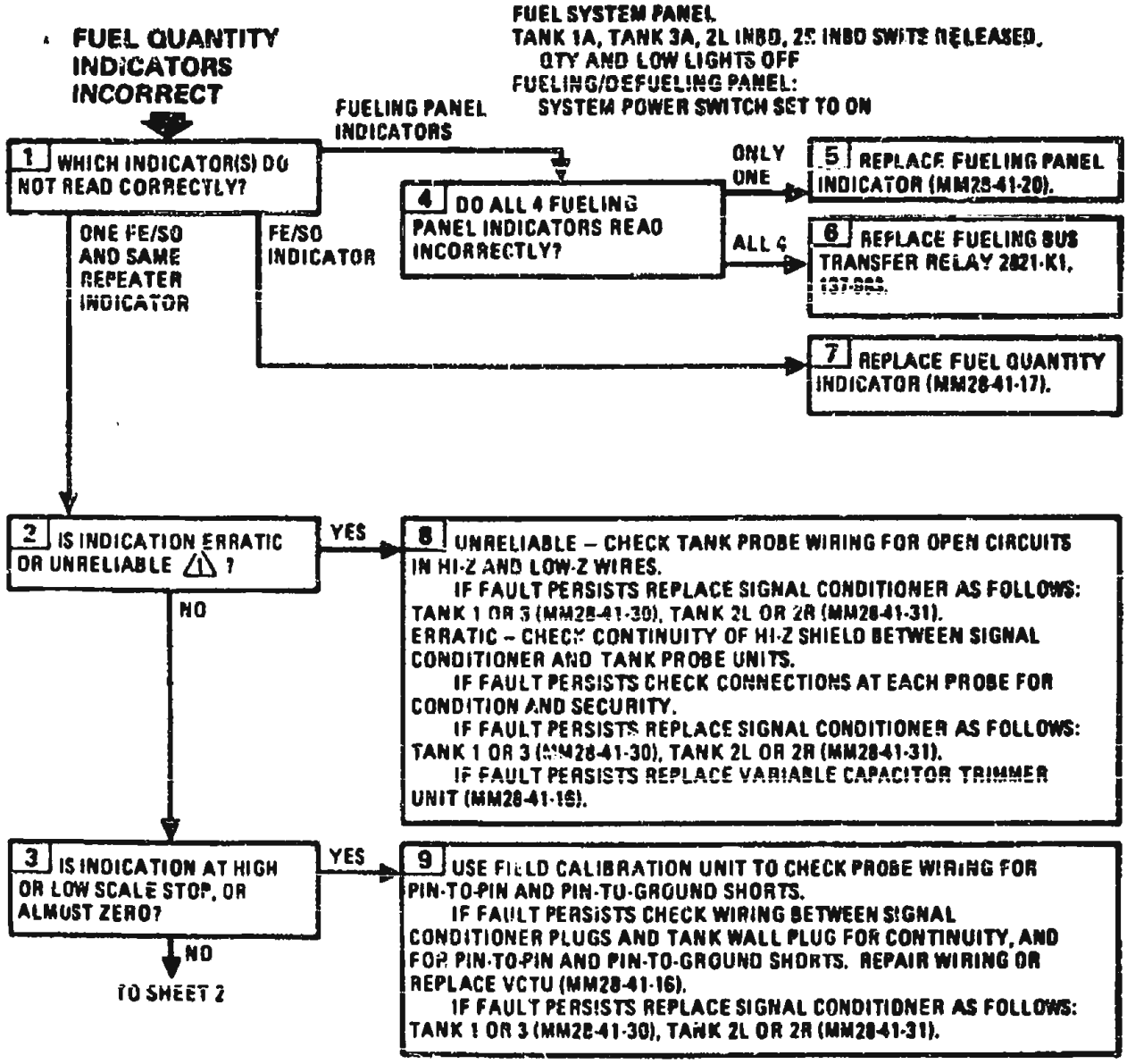


Components Locator
Figure 102 (Sheet 1)



Components Locator
Figure 102 (Sheet 2)

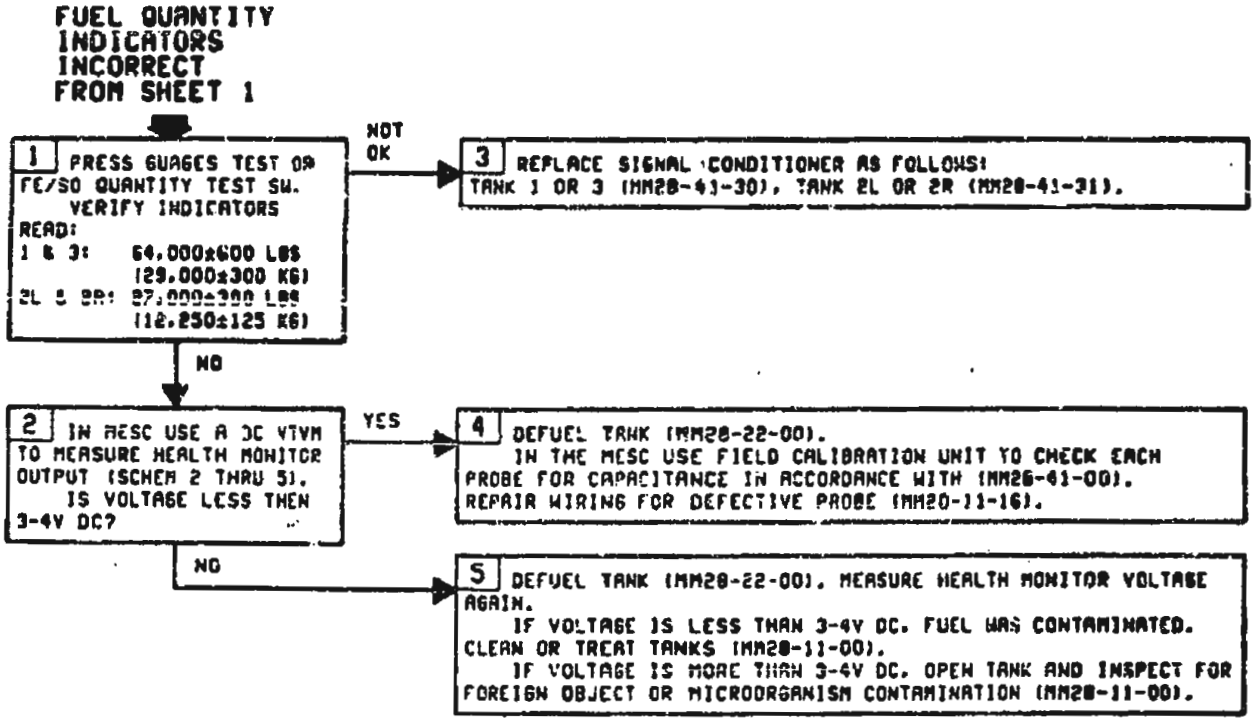
PREREQUISITES
ELECTRICAL POWER (MM24-06-30).
CB'S: CB3-T1 THRU T5
GALLEY RIGHT: 15A, 16H
GALLEY LEFT: 21B
FUEL SYSTEM PANEL
TANK 1A, TANK 3A, 2L INBD, 2R INBD SWITS RELEASED,
QTY AND LOW LIGHTS OFF
FUELING/DEFUELING PANEL:
SYSTEM POWER SWITCH SET TO ON


FUEL QUANTITY INDICATORS INCORRECT
1 WHICH INDICATOR(S) DO NOT READ CORRECTLY?
FUELING PANEL INDICATORS
ONE FE/SO AND SAME REPEATER INDICATOR
FE/SO INDICATOR
4 DO ALL 4 FUELING PANEL INDICATORS READ INCORRECTLY?
ONLY ONE
5 REPLACE FUELING PANEL INDICATOR (MM28-41-20).
ALL 4
6 REPLACE FUELING BUS TRANSFER RELAY 2821-K1, 137-003.
7 REPLACE FUEL QUANTITY INDICATOR (MM28-41-17).
2 IS INDICATION ERRATIC OR UNRELIABLE (1) ?
YES
8 UNRELIABLE – CHECK TANK PROBE WIRING FOR OPEN CIRCUITS IN HI-Z AND LOW-Z WIRES.
IF FAULT PERSISTS REPLACE SIGNAL CONDITIONER AS FOLLOWS: TANK 1 OR 3 (MM28-41-30), TANK 2L OR 2R (MM28-41-31).
ERRATIC – CHECK CONTINUITY OF HI-Z SHIELD BETWEEN SIGNAL CONDITIONER AND TANK PROBE UNITS.
IF FAULT PERSISTS CHECK CONNECTIONS AT EACH PROBE FOR CONDITION AND SECURITY.
IF FAULT PERSISTS REPLACE SIGNAL CONDITIONER AS FOLLOWS: TANK 1 OR 3 (MM28-41-30), TANK 2L OR 2R (MM28-41-31).
IF FAULT PERSISTS REPLACE VARIABLE CAPACITOR TRIMMER UNIT (MM28-41-16).
NO
3 IS INDICATION AT HIGH OR LOW SCALE STOP, OR ALMOST ZERO?
YES
9 USE FIELD CALIBRATION UNIT TO CHECK PROBE WIRING FOR PIN-TO-PIN AND PIN-TO-GROUND SHORTS.
IF FAULT PERSISTS CHECK WIRING BETWEEN SIGNAL CONDITIONER PLUGS AND TANK WALL PLUG FOR CONTINUITY, AND FOR PIN-TO-PIN AND PIN-TO-GROUND SHORTS. REPAIR WIRING OR REPLACE VCTU (MM28-41-16).
IF FAULT PERSISTS REPLACE SIGNAL CONDITIONER AS FOLLOWS: TANK 1 OR 3 (MM28-41-30), TANK 2L OR 2R (MM28-41-31).
NO
TO SHEET 2

(1) NOTE
INDICATOR READS DIFFERENT IN AIR AND ON GROUND

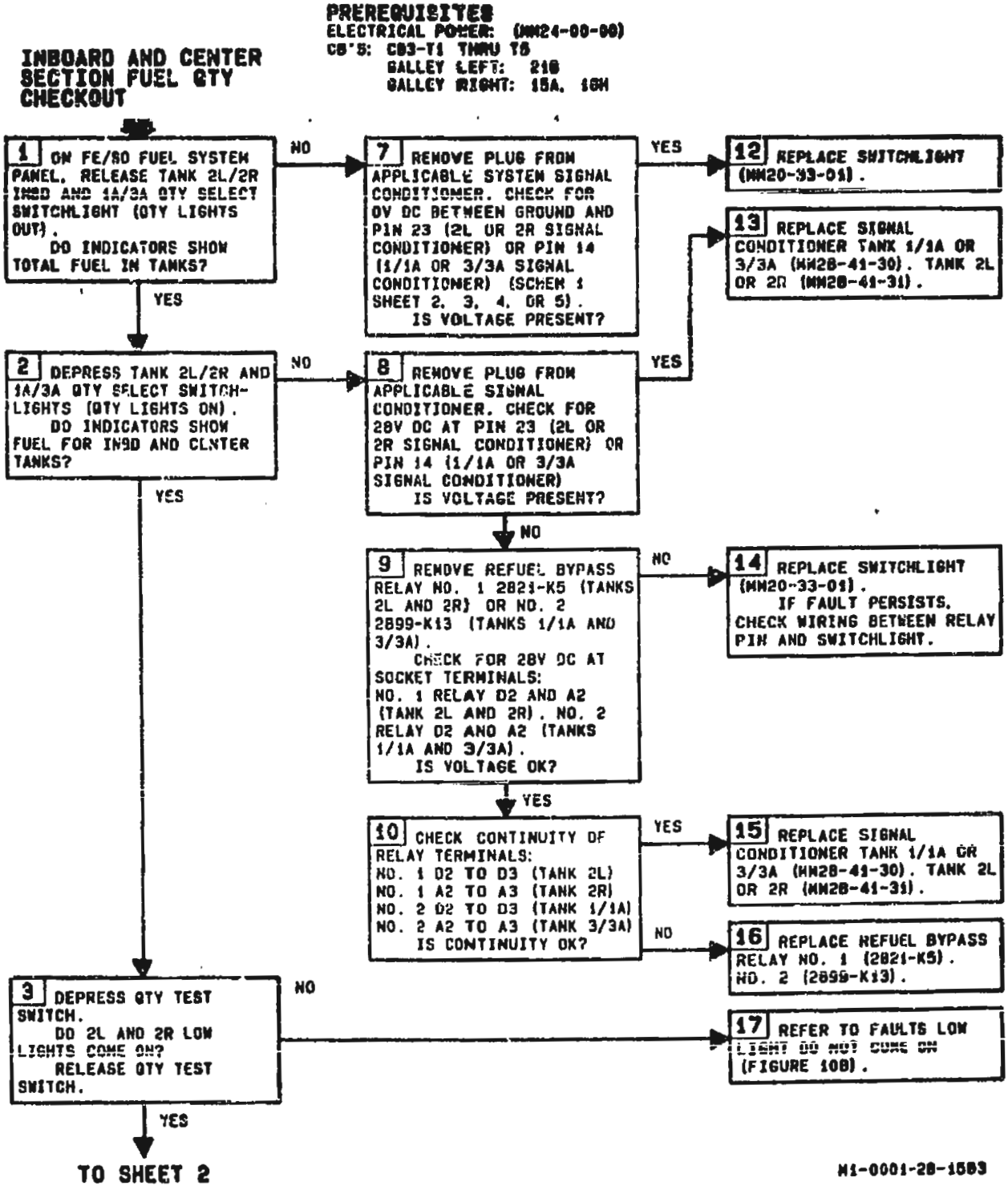
M1-0006-28-1078

Fuel Quantity Indicators Incorrect
Figure 103 (Sheet 1)


FUEL QUANTITY INDICATORS INCORRECT FROM SHEET 1
1 PRESS GUAGES TEST OR FE/SO QUANTITY TEST SW. VERIFY INDICATORS READ:
1 & 3: 64,000±600 LBS (29,000±300 KG)
2L & 2R: 27,000±300 LBS (12,250±125 KG)
NOT OK
3 REPLACE SIGNAL CONDITIONER AS FOLLOWS: TANK 1 OR 3 (MM28-41-30), TANK 2L OR 2R (MM28-41-31).
NO
2 IN MESC USE A DC VTVM TO MEASURE HEALTH MONITOR OUTPUT (SCHEM 2 THRU 5). IS VOLTAGE LESS THEN 3-4V DC?
YES
4 DEFUEL TANK (MM28-22-00). IN THE MESC USE FIELD CALIBRATION UNIT TO CHECK EACH PROBE FOR CAPACITANCE IN ACCORDANCE WITH (MM26-41-00). REPAIR WIRING FOR DEFECTIVE PROBE (MM20-11-16).
NO
5 DEFUEL TANK (MM28-22-00). MEASURE HEALTH MONITOR VOLTAGE AGAIN. IF VOLTAGE IS LESS THAN 3-4V DC, FUEL WAS CONTAMINATED. CLEAN OR TREAT TANKS (MM28-11-00). IF VOLTAGE IS MORE THAN 3-4V DC, OPEN TANK AND INSPECT FOR FOREIGN OBJECT OR MICROORGANISM CONTAMINATION (MM28-11-00).

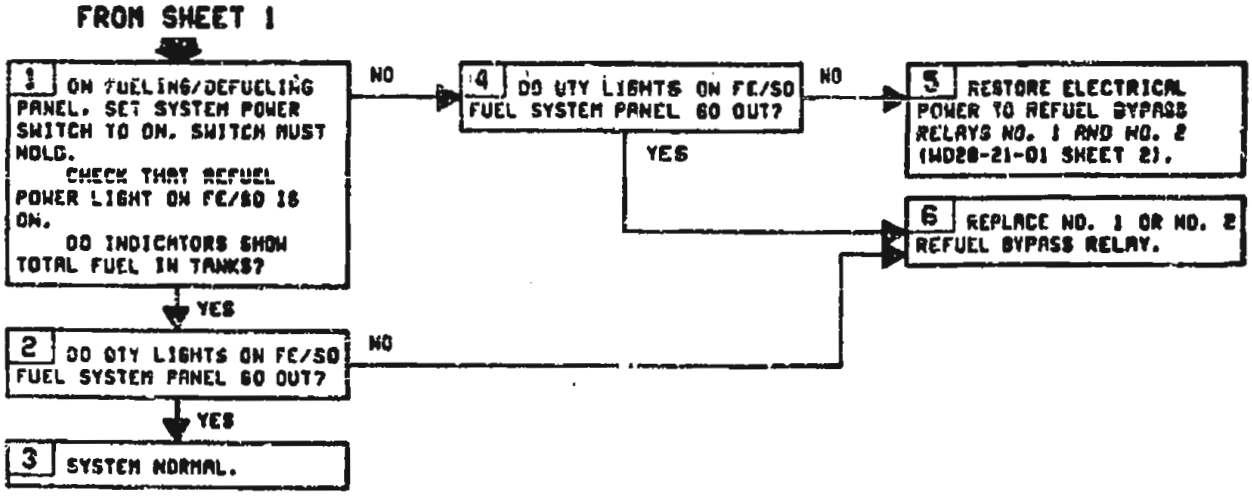
M1-0000-29-1380

Fuel Quantity Indicators Incorrect
Figure 103 (Sheet 2)


INBOARD AND CENTER SECTION FUEL QTY CHECKOUT
PREREQUISITES
ELECTRICAL POWER: (MM24-00-00)
CB'S: CB3-T1 THRU T5
GALLEY LEFT: 21B
GALLEY RIGHT: 15A, 16H
1 ON FE/SO FUEL SYSTEM PANEL, RELEASE TANK 2L/2R INBD AND 1A/3A QTY SELECT SWITCHLIGHT (QTY LIGHTS OUT).
DO INDICATORS SHOW TOTAL FUEL IN TANKS?
NO
YES
2 DEPRESS TANK 2L/2R AND 1A/3A QTY SELECT SWITCHLIGHTS (QTY LIGHTS ON).
DO INDICATORS SHOW FUEL FOR INBD AND CENTER TANKS?
NO
YES
3 DEPRESS QTY TEST SWITCH.
DO 2L AND 2R LOW LIGHTS COME ON?
RELEASE QTY TEST SWITCH.
NO
YES
TO SHEET 2
7 REMOVE PLUG FROM APPLICABLE SYSTEM SIGNAL CONDITIONER. CHECK FOR OV DC BETWEEN GROUND AND PIN 23 (2L OR 2R SIGNAL CONDITIONER) OR PIN 14 (1/1A OR 3/3A SIGNAL CONDITIONER) (SCHEM 1 SHEET 2, 3, 4, OR 5).
IS VOLTAGE PRESENT?
YES
NO
8 REMOVE PLUG FROM APPLICABLE SIGNAL CONDITIONER. CHECK FOR 28V DC AT PIN 23 (2L OR 2R SIGNAL CONDITIONER) OR PIN 14 (1/1A OR 3/3A SIGNAL CONDITIONER)
IS VOLTAGE PRESENT?
YES
NO
9 REMOVE REFUEL BYPASS RELAY NO. 1 2821-K5 (TANKS 2L AND 2R) OR NO. 2 2899-K13 (TANKS 1/1A AND 3/3A).
CHECK FOR 28V DC AT SOCKET TERMINALS:
NO. 1 RELAY D2 AND A2 (TANK 2L AND 2R). NO. 2 RELAY D2 AND A2 (TANKS 1/1A AND 3/3A).
IS VOLTAGE OK?
NO
YES
10 CHECK CONTINUITY OF RELAY TERMINALS:
NO. 1 D2 TO D3 (TANK 2L)
NO. 1 A2 TO A3 (TANK 2R)
NO. 2 D2 TO D3 (TANK 1/1A)
NO. 2 A2 TO A3 (TANK 3/3A)
IS CONTINUITY OK?
YES
NO
12 REPLACE SWITCHLIGHT (MM20-33-01).
13 REPLACE SIGNAL CONDITIONER TANK 1/1A OR 3/3A (MM28-41-30). TANK 2L OR 2R (MM28-41-31).
14 REPLACE SWITCHLIGHT (MM20-33-01).
IF FAULT PERSISTS, CHECK WIRING BETWEEN RELAY PIN AND SWITCHLIGHT.
15 REPLACE SIGNAL CONDITIONER TANK 1/1A OR 3/3A (MM28-41-30). TANK 2L OR 2R (MM28-41-31).
16 REPLACE REFUEL BYPASS RELAY NO. 1 (2821-K5). NO. 2 (2899-K13).
17 REFER TO FAULTS LOW LIGHT DO NOT COME ON (FIGURE 108).
M1-0001-28-1583

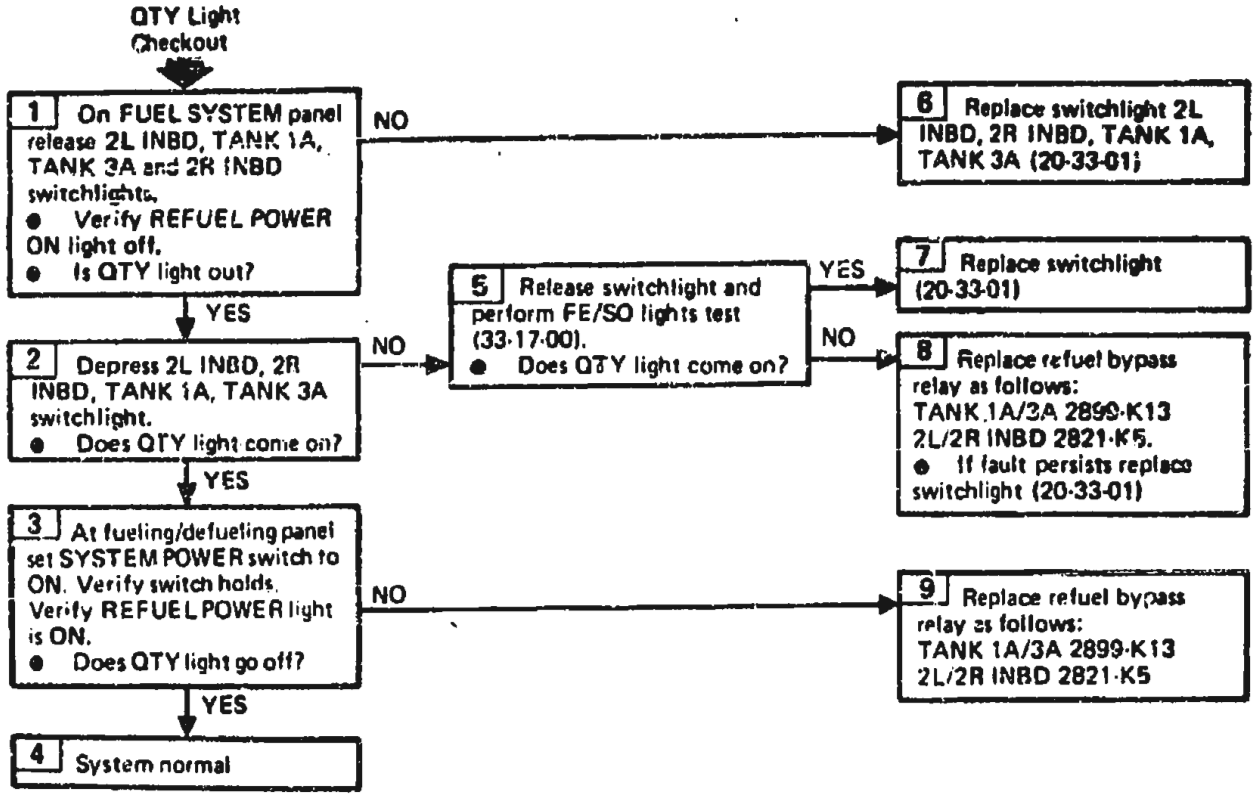
R Inboard and Center Section Fuel Quantity Checkout
R Figure 104 (Sheet 1)

PREREQUISITES
SEE SHEET 1


FROM SHEET 1
1 ON FUELING/DEFUELING PANEL, SET SYSTEM POWER SWITCH TO ON. SWITCH MUST HOLD.
CHECK THAT REFUEL POWER LIGHT ON FE/SO IS ON.
DO INDICATORS SHOW TOTAL FUEL IN TANKS?
NO
YES
2 DO QTY LIGHTS ON FE/SO FUEL SYSTEM PANEL GO OUT?
NO
YES
3 SYSTEM NORMAL.
4 DO QTY LIGHTS ON FE/SO FUEL SYSTEM PANEL GO OUT?
NO
YES
5 RESTORE ELECTRICAL POWER TO REFUEL BYPASS RELAYS NO. 1 AND NO. 2 (WD28-21-01 SHEET 2).
6 REPLACE NO. 1 OR NO. 2 REFUEL BYPASS RELAY.

M1-0000-69-1812

Inboard and Center Section Fuel Quantity Checkout
Figure 104 (Sheet 2)

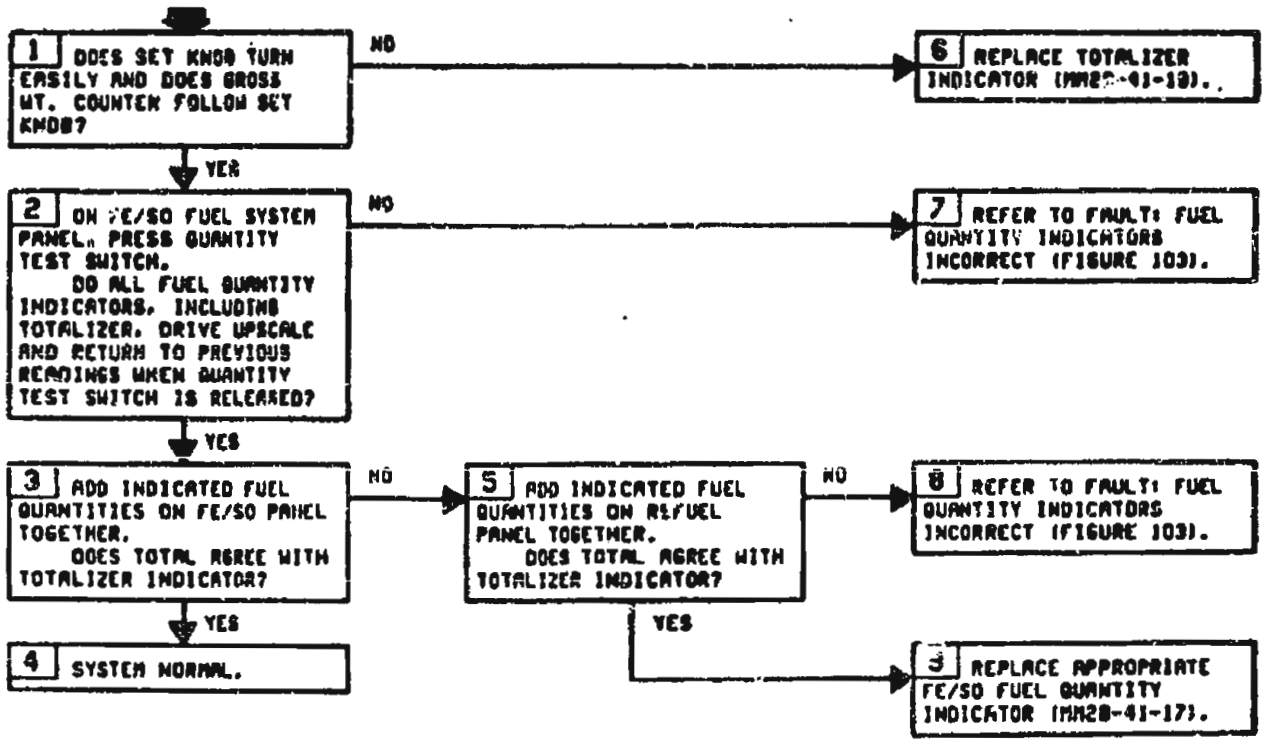

QTY Light Checkout
1 On FUEL SYSTEM panel release 2L INBD, TANK 1A, TANK 3A and 2R INBD switchlights.
● Verify REFUEL POWER ON light off.
● Is QTY light out?
NO
6 Replace switchlight 2L INBD, 2R INBD, TANK 1A, TANK 3A (20-33-01)
YES
2 Depress 2L INBD, 2R INBD, TANK 1A, TANK 3A switchlight.
● Does QTY light come on?
NO
5 Release switchlight and perform FE/SO lights test (33-17-00).
● Does QTY light come on?
YES
7 Replace switchlight (20-33-01)
NO
8 Replace refuel bypass relay as follows:
TANK 1A/3A 2899-K13
2L/2R INBD 2821-K5.
● If fault persists replace switchlight (20-33-01)
YES
3 At fueling/defueling panel set SYSTEM POWER switch to ON. Verify switch holds. Verify REFUEL POWER light is ON.
● Does QTY light go off?
NO
9 Replace refuel bypass relay as follows:
TANK 1A/3A 2899-K13
2L/2R INBD 2821-K5
YES
4 System normal

PREREQUISITES
Elec Pwr (24-00-00)
CB's: CB2-H5, J4

M1-E2501-28-1126

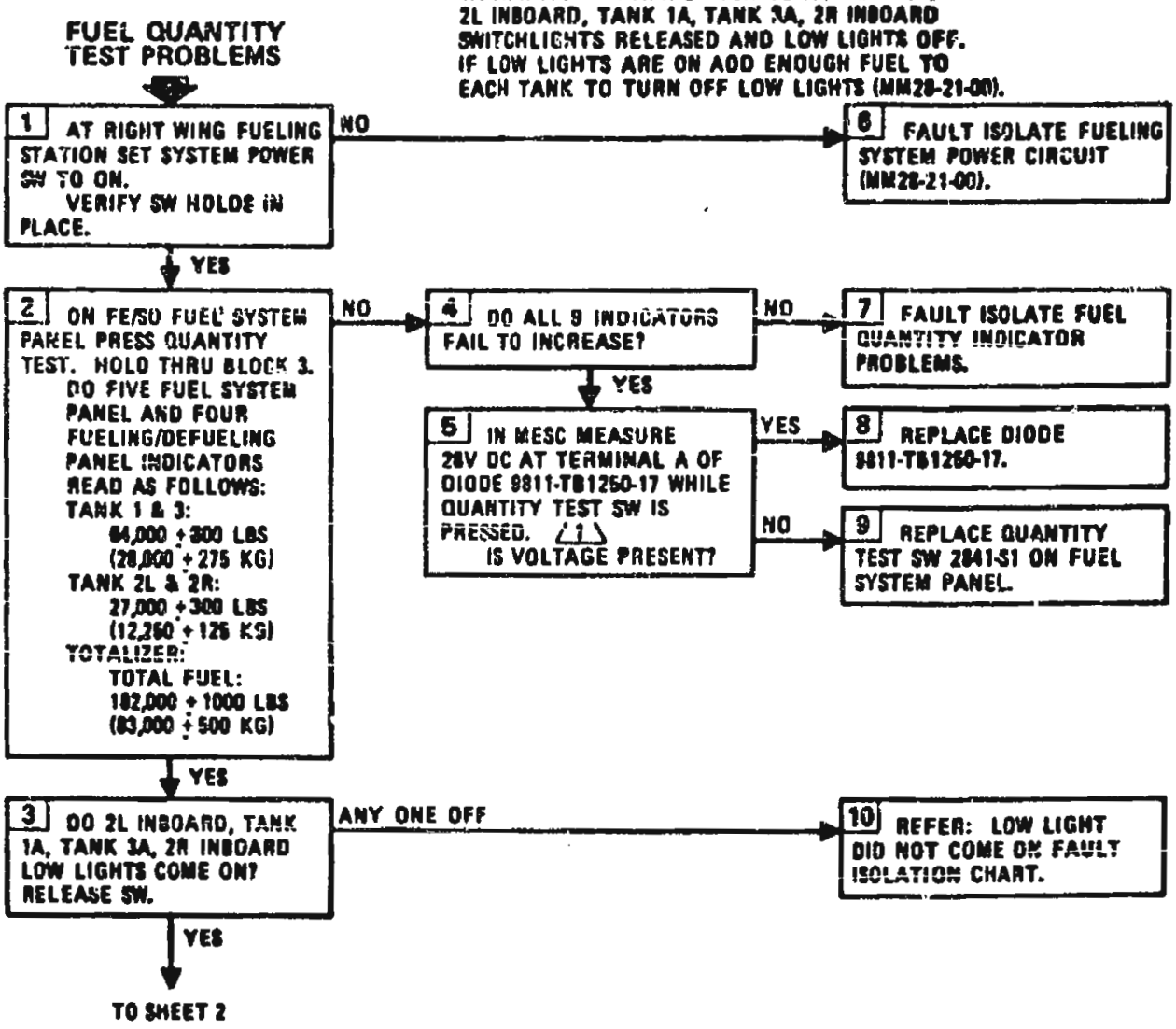
QTY Light Checkout
Figure 105

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: CB PANEL 3, T1 THRU T5


TOTALIZER PROBLEMS
1 DOES SET KNOB TURN EASILY AND DOES GROSS WT. COUNTER FOLLOW SET KNOB?
NO
6 REPLACE TOTALIZER INDICATOR (MM28-41-19).
YES
2 ON FE/SO FUEL SYSTEM PANEL, PRESS QUANTITY TEST SWITCH.
DO ALL FUEL QUANTITY INDICATORS, INCLUDING TOTALIZER, DRIVE UPSCALE AND RETURN TO PREVIOUS READINGS WHEN QUANTITY TEST SWITCH IS RELEASED?
NO
7 REFER TO FAULT: FUEL QUANTITY INDICATORS INCORRECT (FIGURE 103).
YES
3 ADD INDICATED FUEL QUANTITIES ON FE/SO PANEL TOGETHER.
DOES TOTAL AGREE WITH TOTALIZER INDICATOR?
NO
5 ADD INDICATED FUEL QUANTITIES ON REFUEL PANEL TOGETHER.
DOES TOTAL AGREE WITH TOTALIZER INDICATOR?
NO
8 REFER TO FAULT: FUEL QUANTITY INDICATORS INCORRECT (FIGURE 103).
YES
4 SYSTEM NORMAL.
YES
3 REPLACE APPROPRIATE FE/SO FUEL QUANTITY INDICATOR (MM28-41-17).

Totalizer Problems
Figure 106

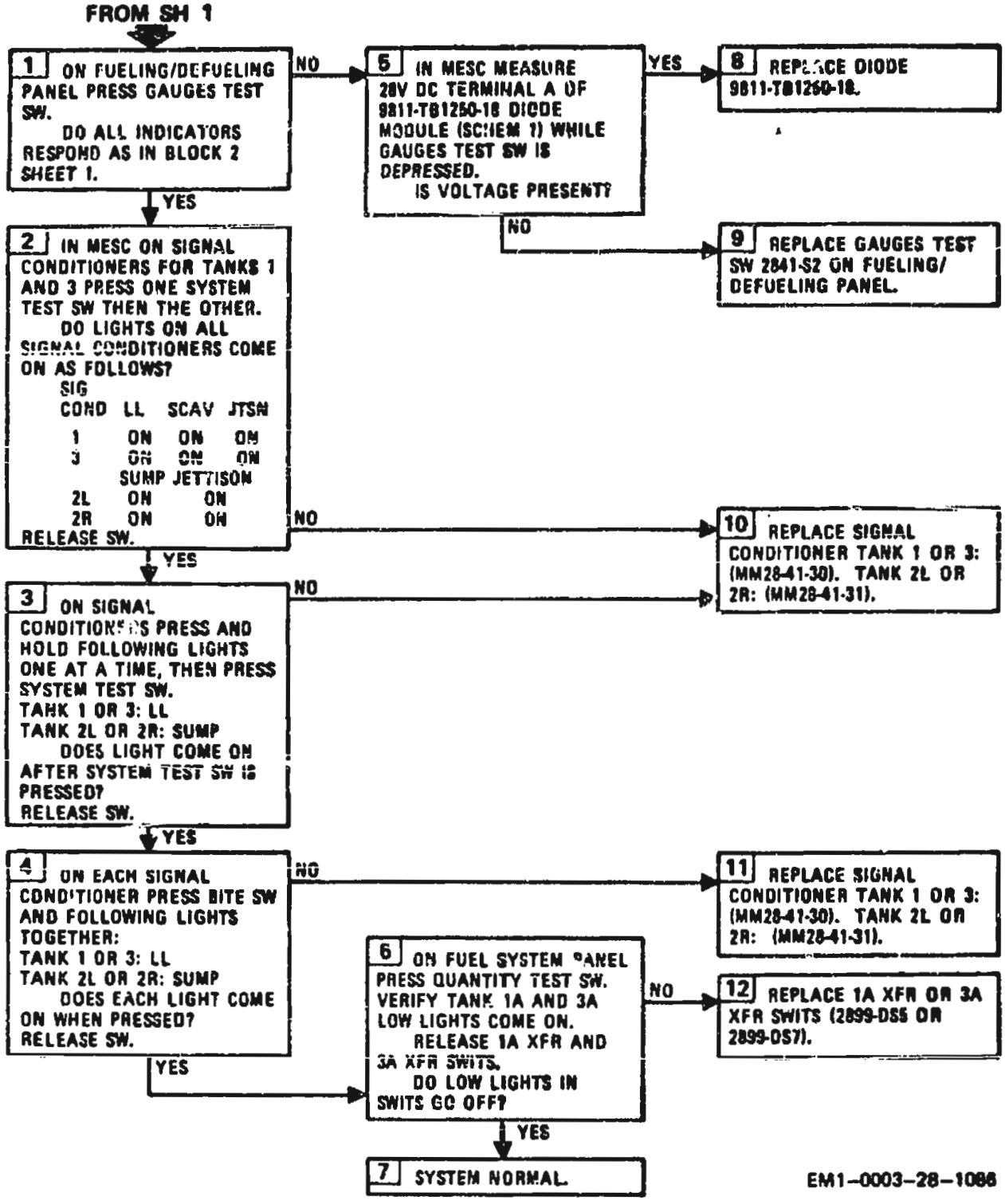
PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: CB3-T1 THRU T5
GALLEY RIGHT: A15, H16
GALLEY LEFT: B21
FUEL SYSTEM PANEL:
1A XFR AND 3A XFR SWITCHLIGHTS DEPRESSED
2L INBOARD, TANK 1A, TANK 3A, 2R INBOARD SWITCHLIGHTS RELEASED AND LOW LIGHTS OFF.
IF LOW LIGHTS ARE ON ADD ENOUGH FUEL TO EACH TANK TO TURN OFF LOW LIGHTS (MM28-21-00).


FUEL QUANTITY TEST PROBLEMS
1 AT RIGHT WING FUELING STATION SET SYSTEM POWER SW TO ON.
VERIFY SW HOLDS IN PLACE.
NO
6 FAULT ISOLATE FUELING SYSTEM POWER CIRCUIT (MM28-21-00).
YES
2 ON FE/SO FUEL SYSTEM PANEL PRESS QUANTITY TEST. HOLD THRU BLOCK 3.
DO FIVE FUEL SYSTEM PANEL AND FOUR FUELING/DEFUELING PANEL INDICATORS READ AS FOLLOWS:
TANK 1 & 3:
84,000 ± 300 LBS
(28,000 ± 275 KG)
TANK 2L & 2R:
27,000 ± 300 LBS
(12,250 ± 125 KG)
TOTALIZER:
TOTAL FUEL:
182,000 ± 1000 LBS
(83,000 ± 500 KG)
NO
4 DO ALL 9 INDICATORS FAIL TO INCREASE?
NO
7 FAULT ISOLATE FUEL QUANTITY INDICATOR PROBLEMS.
YES
5 IN MESC MEASURE 28V DC AT TERMINAL A OF DIODE 9811-TB1250-17 WHILE QUANTITY TEST SW IS PRESSED. 1
IS VOLTAGE PRESENT?
YES
8 REPLACE DIODE 9811-TB1250-17.
NO
9 REPLACE QUANTITY TEST SW 2841-S1 ON FUEL SYSTEM PANEL.
YES
3 DO 2L INBOARD, TANK 1A, TANK 3A, 2R INBOARD LOW LIGHTS COME ON? RELEASE SW.
ANY ONE OFF
10 REFER: LOW LIGHT DID NOT COME ON FAULT ISOLATION CHART.
YES
TO SHEET 2

1 NOTE
FUEL QUANTITY INDICATING SYSTEM SCHEMATIC.

M1-0006-28-1079

Fuel Quantity Test Problems
Figure 107 (Sheet 1)

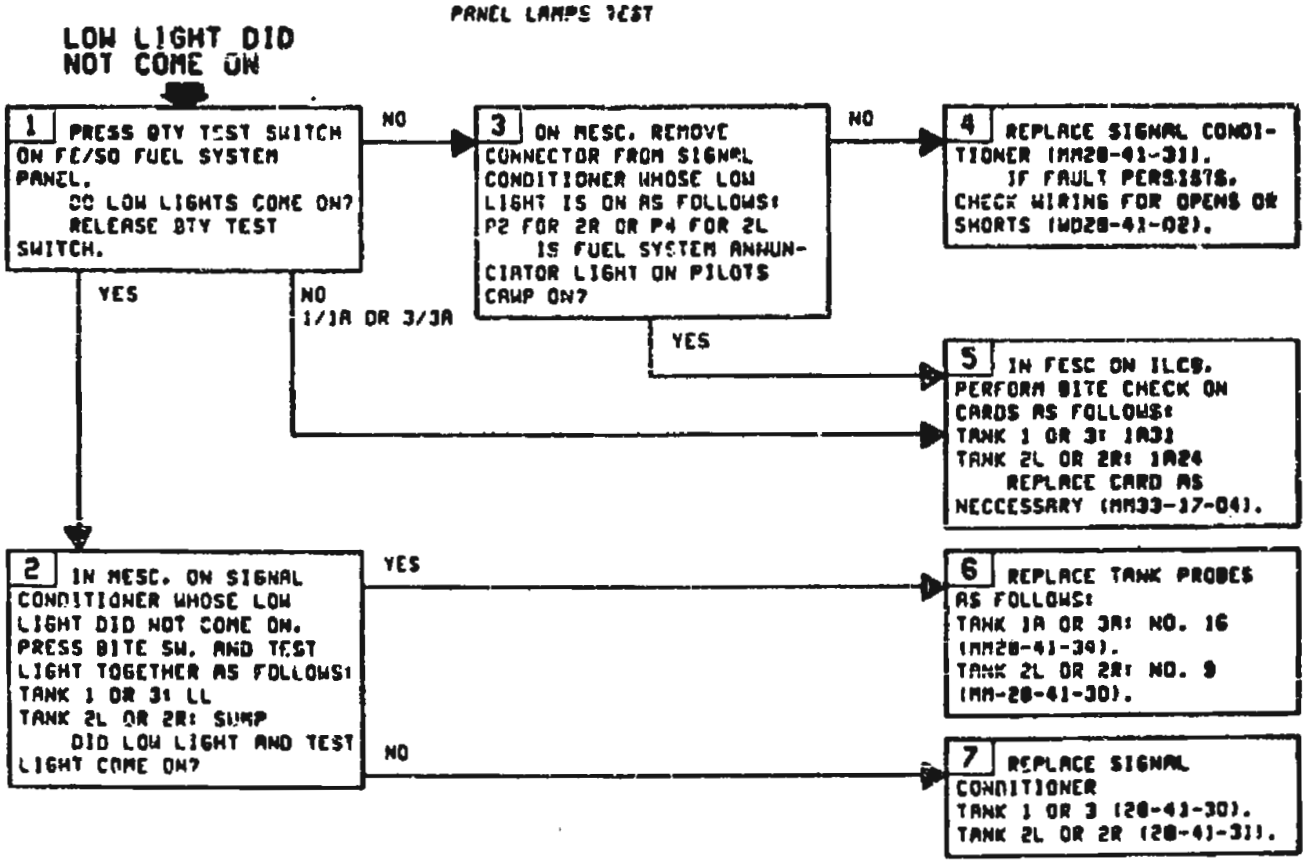

FROM SH 1
1 ON FUELING/DEFUELING PANEL PRESS GAUGES TEST SW.
DO ALL INDICATORS RESPOND AS IN BLOCK 2 SHEET 1.
NO
YES
5 IN MESC MEASURE 28V DC TERMINAL A OF 9811-TB1250-18 DIODE MODULE (SCHEM 1) WHILE GAUGES TEST SW IS DEPRESSED.
IS VOLTAGE PRESENT?
YES
8 REPLACE DIODE 9811-TB1250-18.
NO
9 REPLACE GAUGES TEST SW 2841-S2 ON FUELING/ DEFUELING PANEL.
2 IN MESC ON SIGNAL CONDITIONERS FOR TANKS 1 AND 3 PRESS ONE SYSTEM TEST SW THEN THE OTHER.
DO LIGHTS ON ALL SIGNAL CONDITIONERS COME ON AS FOLLOWS?
SIG COND LL SCAV JTSN
1 ON ON ON
3 ON ON ON
SUMP JETTISON
2L ON ON
2R ON ON
RELEASE SW.
NO
10 REPLACE SIGNAL CONDITIONER TANK 1 OR 3: (MM28-41-30). TANK 2L OR 2R: (MM28-41-31).
YES
3 ON SIGNAL CONDITIONERS PRESS AND HOLD FOLLOWING LIGHTS ONE AT A TIME, THEN PRESS SYSTEM TEST SW.
TANK 1 OR 3: LL
TANK 2L OR 2R: SUMP
DOES LIGHT COME ON AFTER SYSTEM TEST SW IS PRESSED?
RELEASE SW.
NO
YES
4 ON EACH SIGNAL CONDITIONER PRESS BITE SW AND FOLLOWING LIGHTS TOGETHER:
TANK 1 OR 3: LL
TANK 2L OR 2R: SUMP
DOES EACH LIGHT COME ON WHEN PRESSED?
RELEASE SW.
NO
11 REPLACE SIGNAL CONDITIONER TANK 1 OR 3: (MM28-41-30). TANK 2L OR 2R: (MM28-41-31).
YES
6 ON FUEL SYSTEM PANEL PRESS QUANTITY TEST SW. VERIFY TANK 1A AND 3A LOW LIGHTS COME ON.
RELEASE 1A XFR AND 3A XFR SWITS.
DO LOW LIGHTS IN SWITS GO OFF?
NO
12 REPLACE 1A XFR OR 3A XFR SWITS (2899-DS5 OR 2899-DS7).
YES
7 SYSTEM NORMAL.
EM1-0003-28-1088

Fuel Quantity Test Problems
Figure 107 (Sheet 2)

R EFFECTIVITY: 025-026, 028-999
R

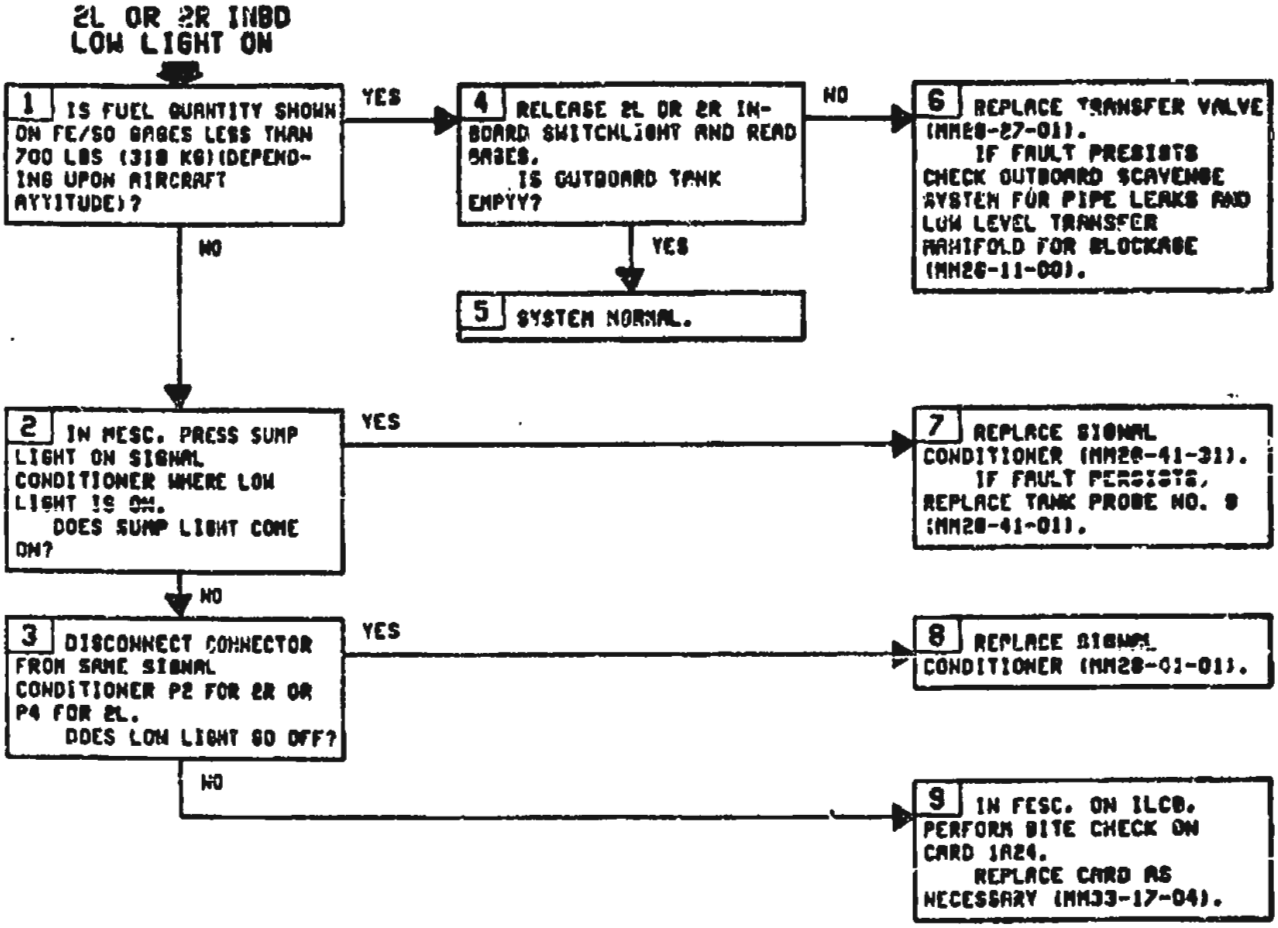
0028

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: C83 T1 THRU T5
FUEL SYSTEM PANEL: REFUEL POWER SWITCHLIGHT PRESSED AND LIGHT OUT
1A AND 3A XFR SWITCHLIGHTS DEPRESSED
FUEL QTY IN 2L AND 2R LESS THAN 400 TO 1000 LBS (182 TO 454 KG)
(DEPENDING ON AIRCRAFT ATTITUDE)
OR 175 LBS (80 KG) FOR TANKS 1A OR 3A
PANEL LAMPS TEST


LOW LIGHT DID NOT COME ON
1 PRESS QTY TEST SWITCH ON FE/SO FUEL SYSTEM PANEL.
DO LOW LIGHTS COME ON? RELEASE QTY TEST SWITCH.
NO
3 ON MESC, REMOVE CONNECTOR FROM SIGNAL CONDITIONER WHOSE LOW LIGHT IS ON AS FOLLOWS: P2 FOR 2R OR P4 FOR 2L
IS FUEL SYSTEM ANNUNCIATOR LIGHT ON PILOTS CRWP ON?
NO
4 REPLACE SIGNAL CONDITIONER (MM28-41-31).
IF FAULT PERSISTS, CHECK WIRING FOR OPENS OR SHORTS (WD28-41-02).
YES
NO
1/1A OR 3/3A
YES
5 IN FESC ON ILCD, PERFORM BITE CHECK ON CARDS AS FOLLOWS:
TANK 1 OR 3: 1A31
TANK 2L OR 2R: 1A24
REPLACE CARD AS NECCESSARY (MM33-17-04).
YES
2 IN MESC, ON SIGNAL CONDITIONER WHOSE LOW LIGHT DID NOT COME ON, PRESS BITE SW, AND TEST LIGHT TOGETHER AS FOLLOWS:
TANK 1 OR 3: LL
TANK 2L OR 2R: SUMP
DID LOW LIGHT AND TEST LIGHT COME ON?
NO
6 REPLACE TANK PROBES AS FOLLOWS:
TANK 1A OR 3A: NO. 16 (MM28-41-34).
TANK 2L OR 2R: NO. 9 (MM-28-41-30).
7 REPLACE SIGNAL CONDITIONER
TANK 1 OR 3 (28-41-30).
TANK 2L OR 2R (28-41-31).

LOW Light Did Not Come On
Figure 108

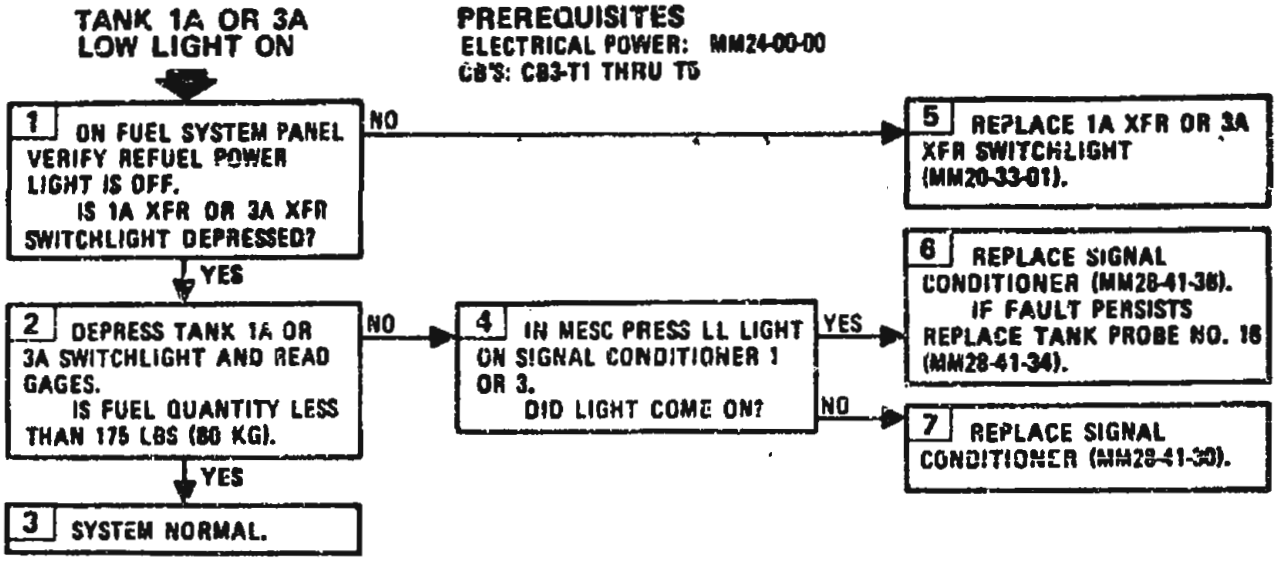
PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: CB3-T1 THRU T5
FUEL SYSTEM PANEL:
2L AND 2R INBD SWITCHLIGHTS DEPRESSED
REFUEL POWER SWITCHLIGHT PRESSED AND ON LIGHT OFF.


2L OR 2R INBD LOW LIGHT ON
1 IS FUEL QUANTITY SHOWN ON FE/SO GAGES LESS THAN 700 LBS (318 KG)(DEPENDING UPON AIRCRAFT ATTITUDE)?
YES
4 RELEASE 2L OR 2R INBOARD SWITCHLIGHT AND READ GAGES. IS OUTBOARD TANK EMPTY?
NO
6 REPLACE TRANSFER VALVE (MM28-27-01). IF FAULT PERSISTS CHECK OUTBOARD SCAVENGE SYSTEM FOR PIPE LEAKS AND LOW LEVEL TRANSFER MANIFOLD FOR BLOCKAGE (MM28-11-00).
YES
5 SYSTEM NORMAL.
NO
2 IN MESC. PRESS SUMP LIGHT ON SIGNAL CONDITIONER WHERE LOW LIGHT IS ON. DOES SUMP LIGHT COME ON?
YES
7 REPLACE SIGNAL CONDITIONER (MM28-41-31). IF FAULT PERSISTS, REPLACE TANK PROBE NO. 8 (MM28-41-01).
NO
3 DISCONNECT CONNECTOR FROM SAME SIGNAL CONDITIONER P2 FOR 2R OR P4 FOR 2L. DOES LOW LIGHT GO OFF?
YES
8 REPLACE SIGNAL CONDITIONER (MM28-01-01).
NO
9 IN FESC. ON ILCB. PERFORM BITE CHECK ON CARD 1A24. REPLACE CARD AS NECESSARY (MM33-17-04).

M1-0001-60-1610

R Tank 2L or 2R INBD LOW Light On
R Figure 109

EFFECTIVITY: 025-026, 028-999

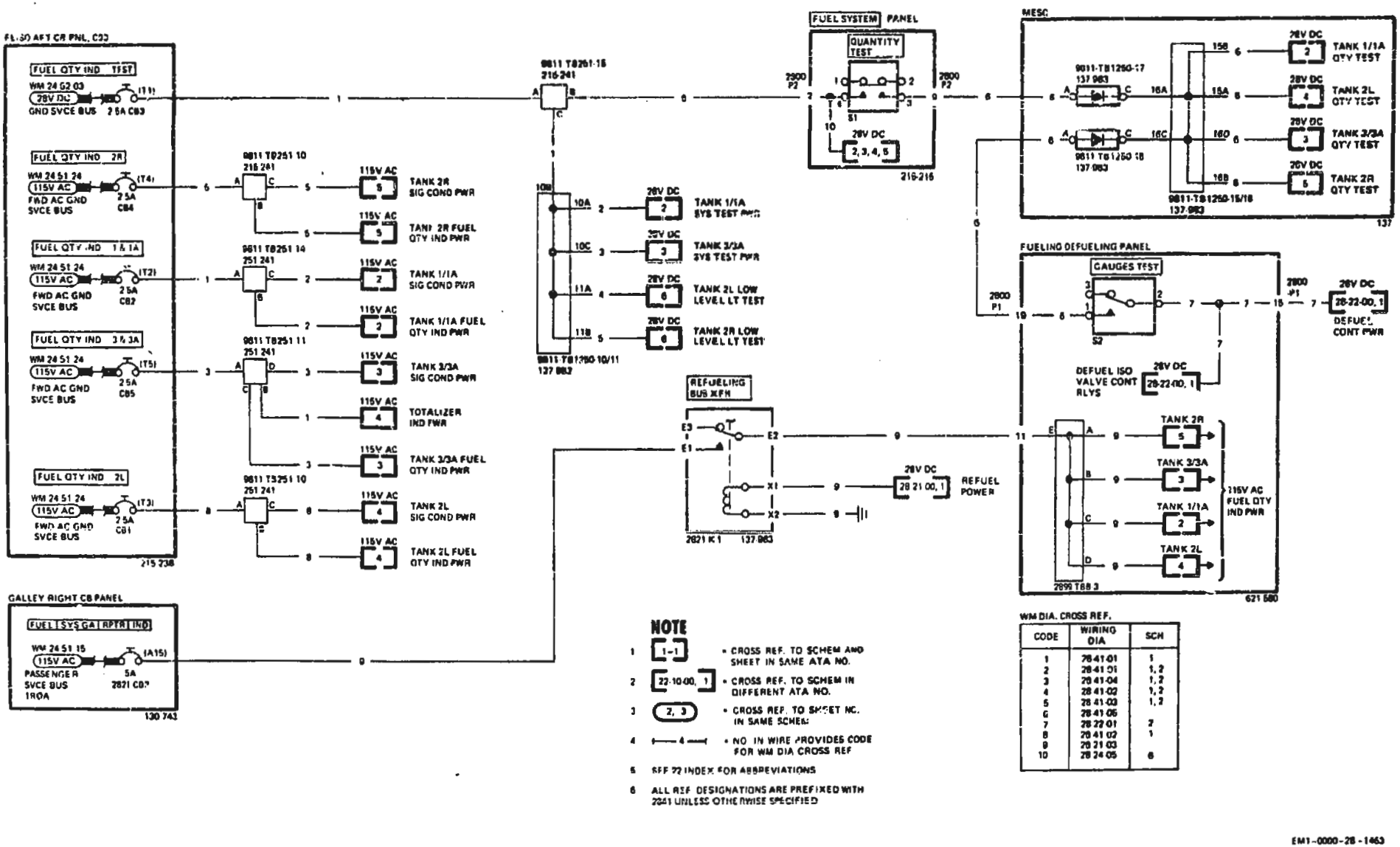

TANK 1A OR 3A LOW LIGHT ON
PREREQUISITES
ELECTRICAL POWER: MM24-00-00
CB'S: CB3-T1 THRU T5
1 ON FUEL SYSTEM PANEL VERIFY REFUEL POWER LIGHT IS OFF.
IS 1A XFR OR 3A XFR SWITCHLIGHT DEPRESSED?
NO
5 REPLACE 1A XFR OR 3A XFR SWITCHLIGHT (MM20-33-01).
YES
2 DEPRESS TANK 1A OR 3A SWITCHLIGHT AND READ GAGES.
IS FUEL QUANTITY LESS THAN 175 LBS (80 KG).
NO
4 IN MESC PRESS LL LIGHT ON SIGNAL CONDITIONER 1 OR 3.
DID LIGHT COME ON?
YES
6 REPLACE SIGNAL CONDITIONER (MM28-41-36).
IF FAULT PERSISTS REPLACE TANK PROBE NO. 16 (MM28-41-34).
NO
7 REPLACE SIGNAL CONDITIONER (MM28-41-30).
YES
3 SYSTEM NORMAL.

M1-0005-28-1082

TANK 1A or 3A LOW Light On
Figure 110

R EFFECTIVITY: 025-026, 028-999
R

0028

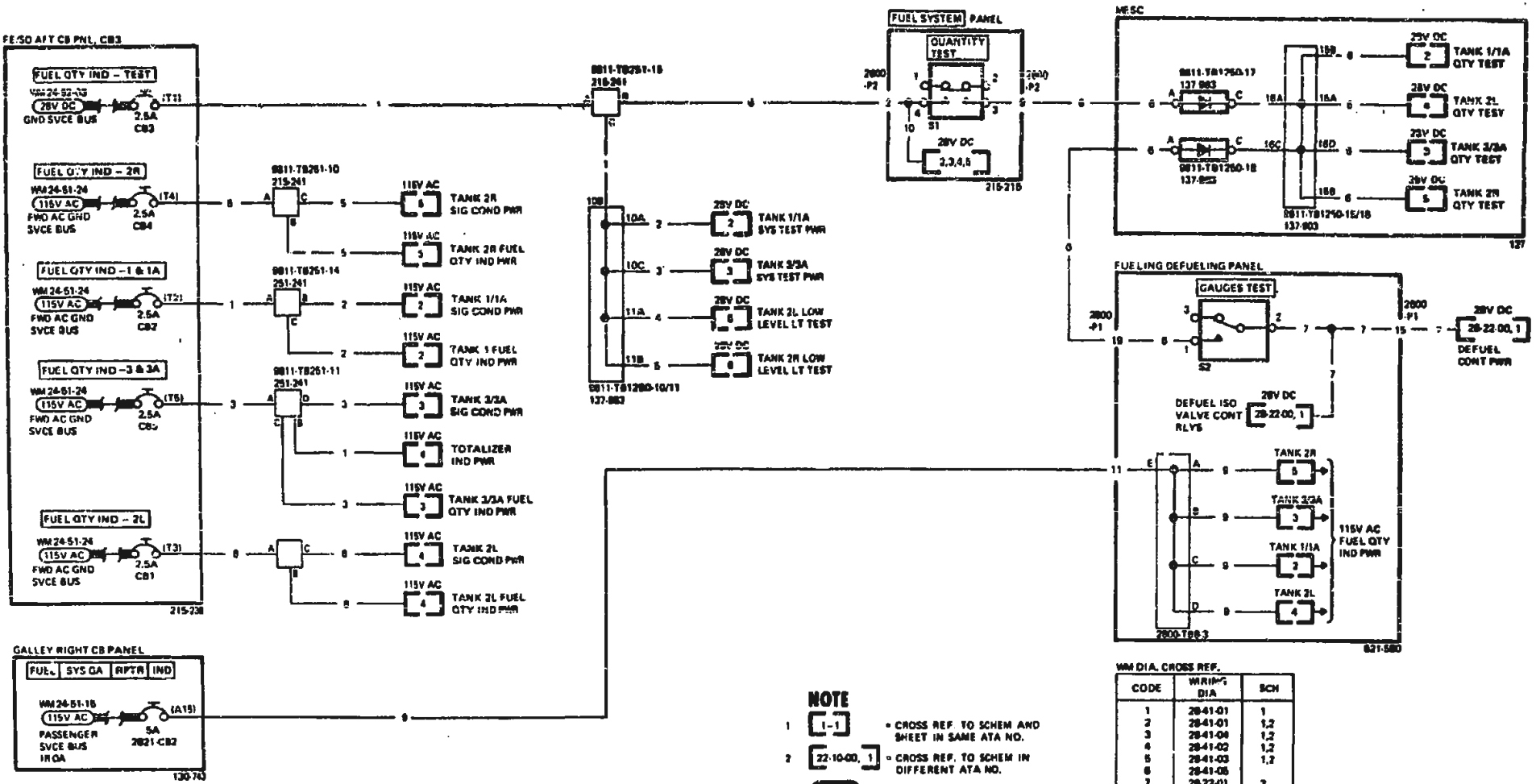

FUEL SYSTEM PANEL
QUANTITY TEST
MISC
FUELING DEFUELING PANEL
GAUGES TEST
REFUELING BUS XFR
TANK 1/1A QTY TEST
TANK 2L QTY TEST
TANK 3/3A QTY TEST
TANK 2R QTY TEST
TANK 1/1A SIG COND PWR
TANK 2R SIG COND PWR
TANK 3/3A SIG COND PWR
TANK 2L SIG COND PWR
TANK 1/1A FUEL QTY IND PWR
TANK 2R FUEL QTY IND PWR
TANK 3/3A FUEL QTY IND PWR
TANK 2L FUEL QTY IND PWR
TOTALIZER IND PWR
TANK 1/1A SYS TEST PWR
TANK 3/3A SYS TEST PWR
TANK 2L LOW LEVEL LT TEST
TANK 2R LOW LEVEL LT TEST
REFUEL POWER
DEFUEL CONT PWR
DEFUEL ISO VALVE CONT RLYS
115V AC FUEL QTY IND PWR
GALLEY RIGHT CB PANEL
FUEL SYS GA RPTR IND
NOTE
CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
CROSS REF. TO SHEET NO. IN SAME SCHEM
NO IN WIRE PROVIDES CODE FOR WM DIA CROSS REF
SEE 22 INDEX FOR ABBREVIATIONS
ALL REF DESIGNATIONS ARE PREFIXED WITH 2341 UNLESS OTHERWISE SPECIFIED
WM DIA. CROSS REF.
CODE
WIRING DIA
SCH

EM1-0000-28-1463

Fuel Quantity Indicating System Power Distribution Schematic
SCHEM 1

R EFFECTIVITY: 025-026, 028-031 WITHOUT SB28-056
R

0028



NOTE

1. [1-1] – CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2. [22-10-00, 1] – CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3. (2, 3) – CROSS REF. TO SHEET NO. IN SAME SCHEM
4. —6— NO. IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.
5. SEE 22 INDEX FOR ABBREVIATIONS
6. ALL REF. DESIGNATIONS ARE PREFIXED WITH 2841 UNLESS OTHERWISE SPECIFIED

WM DIA. CROSS REF.

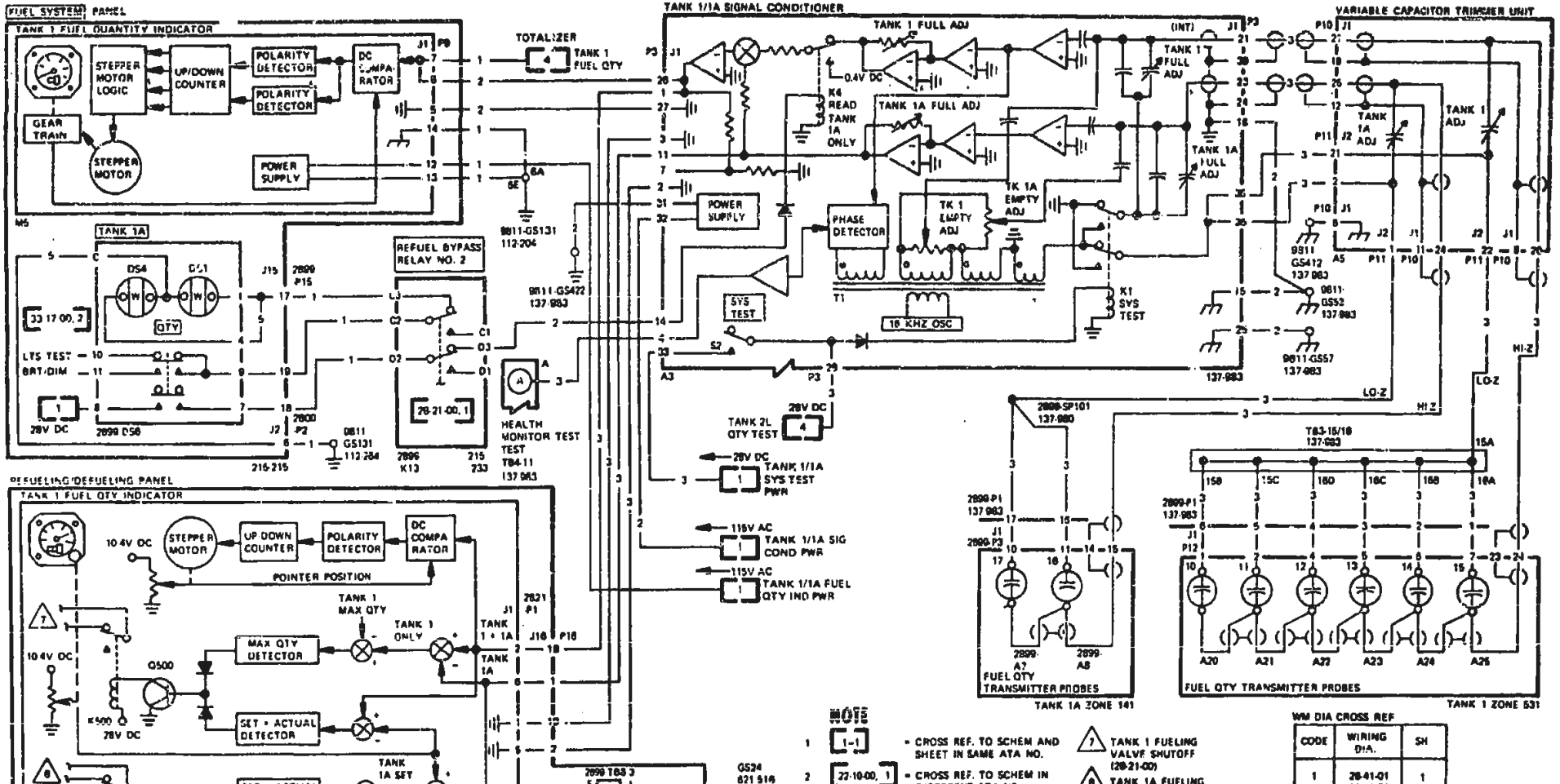
CODE	WIRING DIA	SCH
1	28-41-01	1
2	28-41-01	1,2
3	28-41-04	1,2
4	28-41-02	1,2
5	28-41-03	1,2
6	28-41-05	
7	28-22-01	2
8	28-41-02	1
9	28-21-03	
10	28-24-05	6

EM-0000-28-1404

R Fuel Quantity Indicating System Power Distribution Schematic
R SCHEM 1

EFFECTIVITY: 025-026, 028-031 WITH SB28-056 AND 032-999

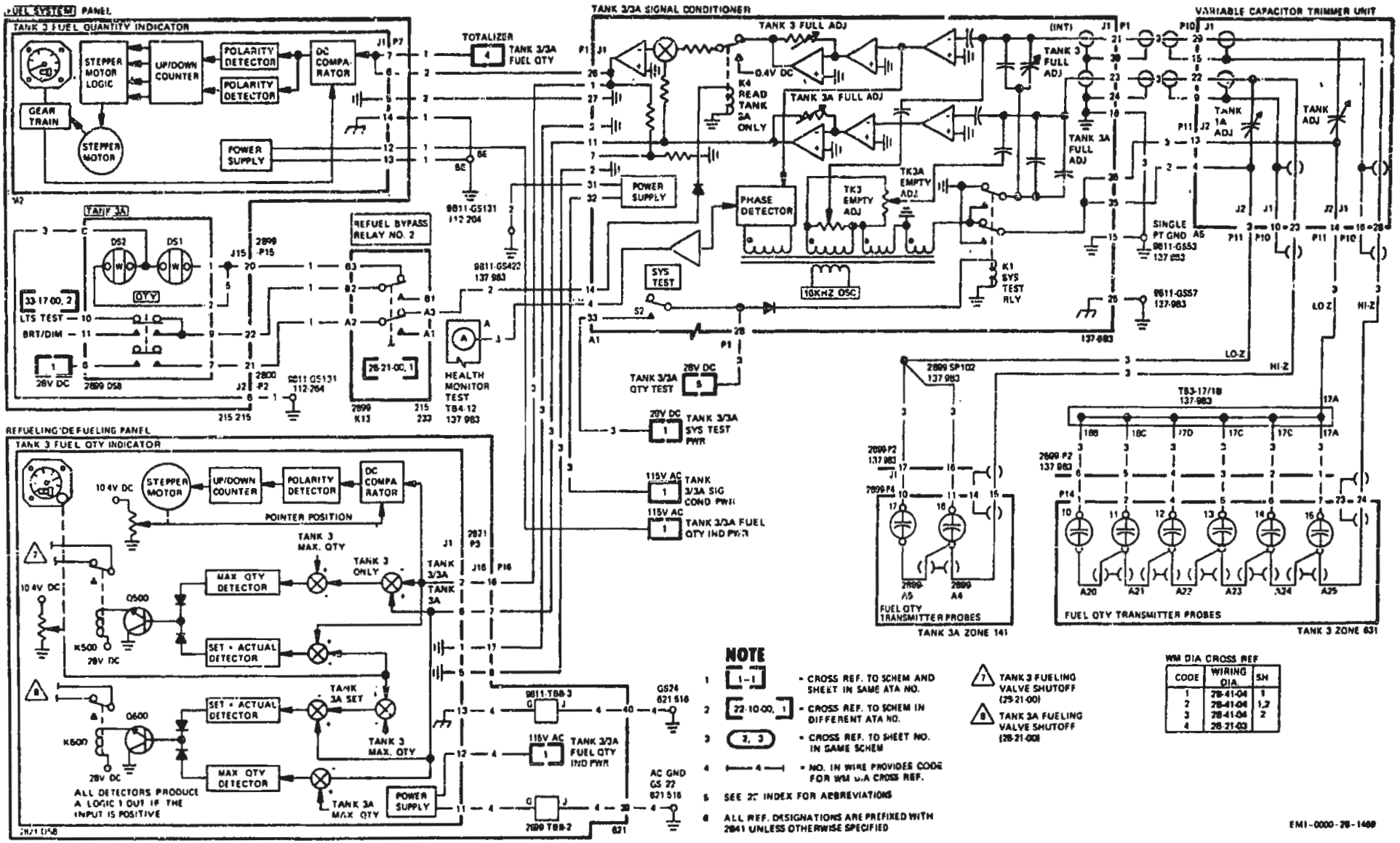
0028


FUEL SYSTEM PANEL
TANK 1 FUEL QUANTITY INDICATOR
STEPPER MOTOR LOGIC
UP/DOWN COUNTER
POLARITY DETECTOR
DC COMPARATOR
GEAR TRAIN
STEPPER MOTOR
POWER SUPPLY
TOTALIZER
TANK 1 FUEL QTY
TANK 1A
REFUEL BYPASS RELAY NO. 2
LTS TEST
BRT-DIM
28V DC
HEALTH MONITOR TEST
TANK 1/1A SIGNAL CONDITIONER
TANK 1 FULL ADJ
TANK 1A FULL ADJ
0.4V DC
K4 READ TANK 1A ONLY
TK 1A EMPTY ADJ
TK 1 EMPTY ADJ
PHASE DETECTOR
18 KHZ OSC
K1 SYS TEST
SYS TEST
TANK 2L QTY TEST
TANK 1/1A SYS TEST PWR
115V AC
TANK 1/1A SIG COND PWR
TANK 1/1A FUEL QTY IND PWR
VARIABLE CAPACITOR TRIMMER UNIT
TANK 1 ADJ
TANK 1A ADJ
HI-Z
LO-Z
FUEL QTY TRANSMITTER PROBES
TANK 1A ZONE 141
TANK 1 ZONE 531
REFUELING/DEFUELING PANEL
TANK 1 FUEL QTY INDICATOR
10.4V DC
POINTER POSITION
TANK 1 MAX QTY
TANK 1 ONLY
MAX QTY DETECTOR
SET = ACTUAL DETECTOR
TANK 1A SET
TANK 1A MAX QTY
ALL DETECTORS PRODUCE A LOGIC 1 OUT IF THE INPUT IS POSITIVE
NOTE
1 1-1 = CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2 22-10-00, 1 = CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3 2, 3 = CROSS REF. TO SHEET NO. IN SAME SCHEM
4 4 = NO. IN WIRE PROVIDES CODE FOR WH DIA CROSS REF.
5 SEE 22 INDEX FOR ABBREVIATIONS
6 ALL REF. DESIGNATIONS ARE PREFIXED WITH 2841 UNLESS OTHERWISE SPECIFIED
7 TANK 1 FUELING VALVE SHUTOFF (28-21-00)
8 TANK 1A FUELING VALVE SHUTOFF (28-21-00)
WH DIA CROSS REF
CODE | WIRING DIA. | SH
1 | 28-41-01 | 1
2 | 28-41-01 | 1, 2
3 | 28-41-01 | 2
FMT-0000-28-1468

Tank 1/1A Fuel Quantity Indicating System Schematic
SCHEM 2

R EFFECTIVITY: 025-026, 028-999
R

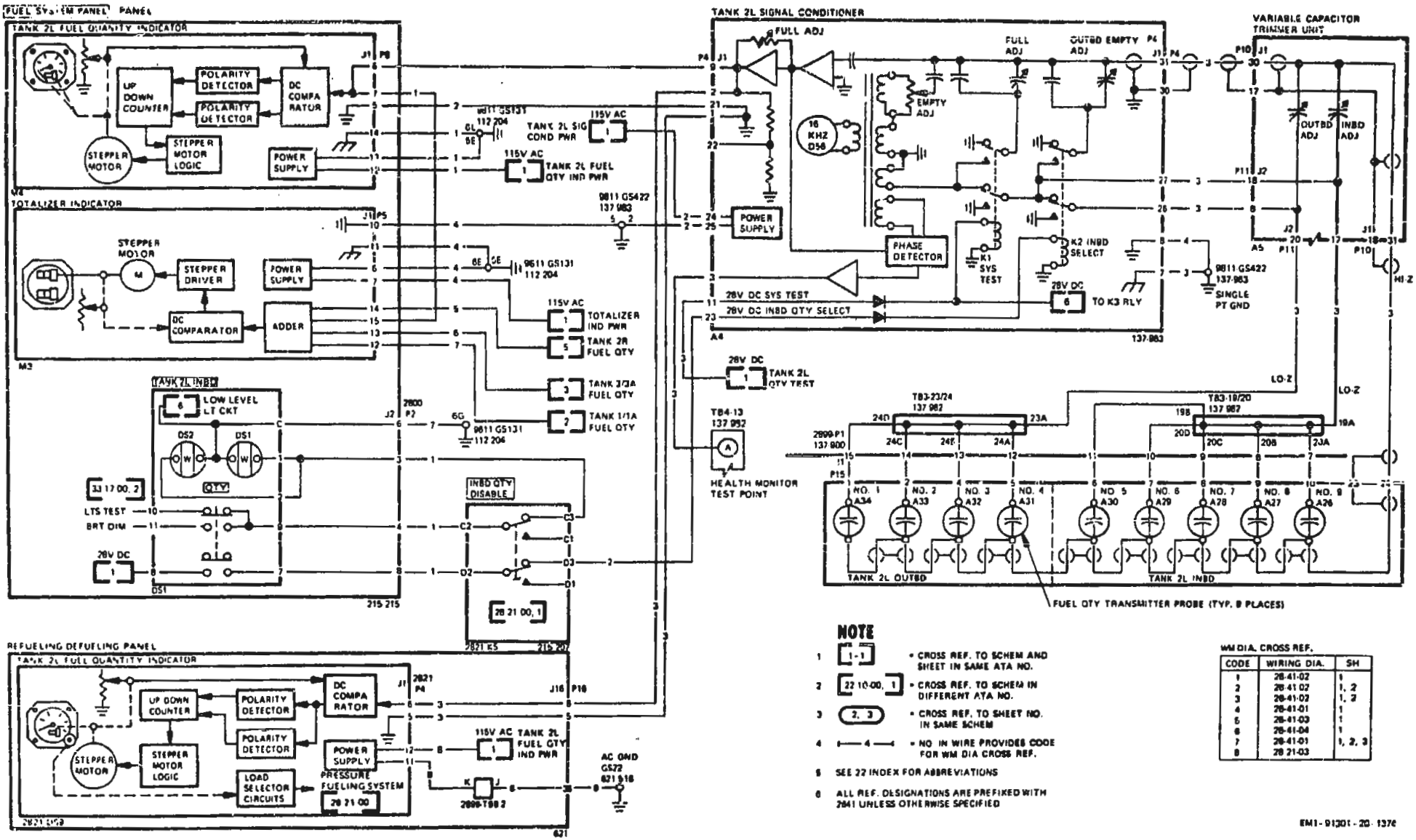
0028



Tank 3/3A Fuel Quantity Indicating System Schematic
SCHEM 3

R EFFECTIVITY: 025-026, 028-999
R

0028



NOTE

1. [1-1] • CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2. [22 10-00, 1] • CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3. (2, 3) • CROSS REF. TO SHEET NO. IN SAME SCHEM
4. —4— • NO IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.
5. SEE 22 INDEX FOR ABBREVIATIONS
6. ALL REF. DESIGNATIONS ARE PREFIXED WITH 2841 UNLESS OTHERWISE SPECIFIED

WM DIA. CROSS REF.

CODE	WIRING DIA.	SH
1	28-41-02	1
2	28-41-02	1, 2
3	28-41-02	1, 2
4	28-41-01	1
5	28-41-03	1
6	28-41-04	1
7	28-41-01	1, 2, 3
8	28 21-03	

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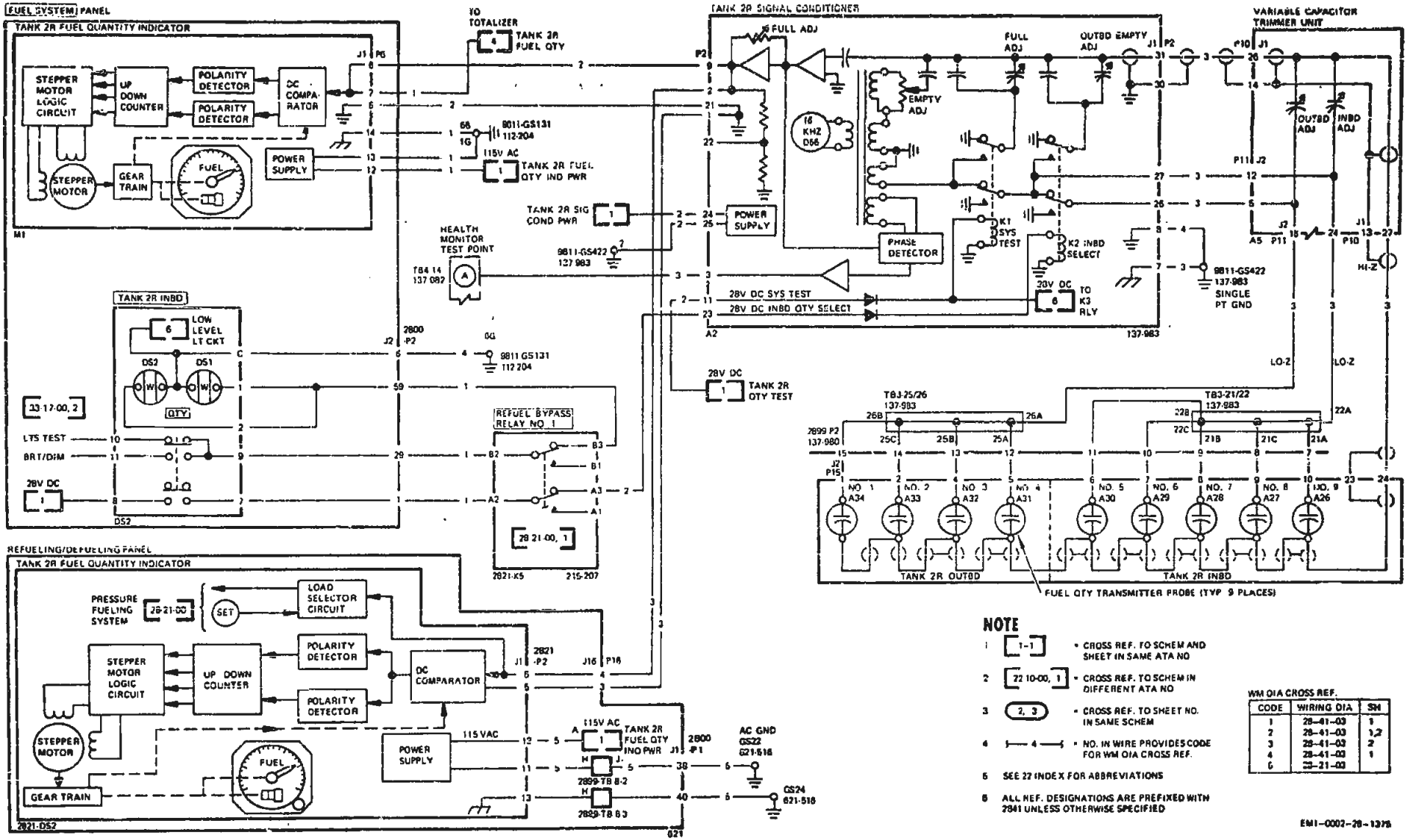
Tank 2L Fuel Quantity Indicating System Schematic
SCHEM 4

R EFFECTIVITY: 025-026, 028-999
R

002e



NOTE

1. [1-1] • CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO
2. [22 10-00, 1] • CROSS REF. TO SCHEM IN DIFFERENT ATA NO
3. (2, 3) • CROSS REF. TO SHEET NO. IN SAME SCHEM
4. 4 • NO. IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.
5. SEE 22 INDEX FOR ABBREVIATIONS
6. ALL REF. DESIGNATIONS ARE PREFIXED WITH 2841 UNLESS OTHERWISE SPECIFIED

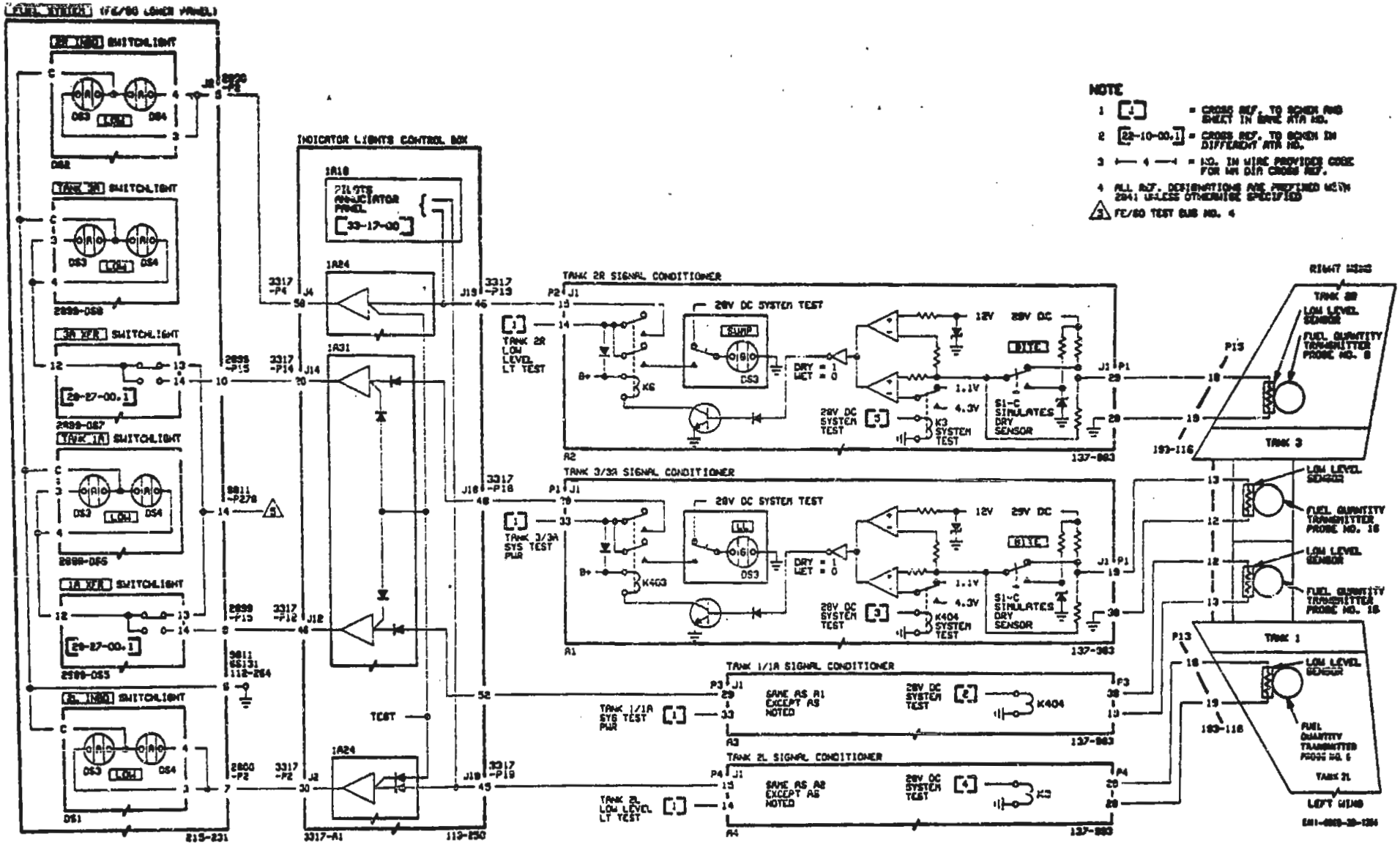
WM DIA CROSS REF.

CODE	WIRING DIA	SH
1	28-41-03	1
2	28-41-03	1,2
3	28-41-03	2
4	28-41-03	1
6	28-21-00	

EMI-0002-28-1375

R Tank 2R Fuel Quantity Indicating System Schematic
R SCHEM 5

EFFECTIVITY: 025-026, 028-999


NOTE
1 [1] = CROSS REF. TO SCHEM PAGE SHEET IN SAME ATA NO.
2 [28-10-00.1] = CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3 ⟵ 4 ⟶ = NO. IN WIRE PROVIDES CODE FOR MX DIA CROSS REF.
4 ALL REF. DESIGNATIONS ARE PREFIXED WITH 2841 UNLESS OTHERWISE SPECIFIED
3 FE/80 TEST SUB NO. 4
INDICATOR LIGHTS CONTROL BOX
TANK 2R SIGNAL CONDITIONER
TANK 3/3A SIGNAL CONDITIONER
TANK 1/1A SIGNAL CONDITIONER
TANK 2L SIGNAL CONDITIONER
28V DC SYSTEM TEST
TANK 2R LOW LEVEL LT TEST
TANK 3/3A SYS TEST PWR
TANK 1/1A SYS TEST PWR
TANK 2L LOW LEVEL LT TEST
SAME AS A1 EXCEPT AS NOTED
SAME AS A2 EXCEPT AS NOTED
TEST
TANK 3
TANK 1
TANK 2L
LOW LEVEL SENSOR
FUEL QUANTITY TRANSMITTER PROBE NO. 6
FUEL QUANTITY TRANSMITTER PROBE NO. 16
LEFT WING
RIGHT WING

R Low Fuel Level Indicating System Schematic
R SCHEM 6

EFFECTIVITY: 025-026, 028-999

FUEL QUANTITY INDICATING SYSTEM - MAINTENANCE PRACTICES

1. General

Perform the following deactivation procedure if one of the four fuel quantity indicating systems is inoperative. During each refuel, check fuel quantity in affected tank by one or more of the methods specified in the MMEL.

NOTE: This deactivation procedure applies only when an aircraft is to be dispatched in accordance with the MEL.

2. Deactivation

A. Fuel Quantity Indicating System

(1) On the Flight Engineer/Second Officers aft circuit breaker panel CB3, open and collar applicable FUEL QTY IND 1, 2L, 2R or 3 circuit breaker (T2-T5) or, remove and stow electrical harness plug at applicable FUEL SYSTEM panel indicator.

(2) Install appropriate placard on fuel system panel.

B. Tanks 1A and 3A Transfer Valves

The following deactivation procedure is required if tanks 1A or 3A indicating system is inoperative.

NOTE: Affected 1A and or 3A Transfer Valve(s) must be deactivated in the closed position.

(1) In left or right MLG wheel well, zone 148 or 149, disconnect the electrical harness connector on the applicable tank 1A or 3A.

(2) Install protective caps on the wiring harness connector and actuator receptacle. Stow connector.

(3) Position actuator over-ride lever to the CLOSED position.

(4) On FE/SO FUEL SYSTEM panel placard TANKS 1A AND OR 3A TRANSFER VALVE(S) INOPERATIVE.

C. If tanks 2L or 2R indicating system inoperative, verify that Fuel Flow Equalizer is operative as follows:

(1) Turn on APU (Ref. 49-00-01).

R NOTE: If APU boost pump is installed, do not turn this
R pump on (fuel flow bypasses the fuel flow
R equalizer when pump is turned on).

R (2) Confirm rotor shaft rotation through the inspection
R window on the side of equalizer housing (satisfactory
R operation is indicated when a black bar indicator on
R the end of the shaft is rotating, varying with engine
R speed).

R (3) Turn off APU (Ref. 49-00-01).

R D. Make appropriate entry in aircraft log book.

R 3. Servicing With An Inoperative Fuel Quantity Gauge

R A. If any fuel quantity indicating system (at refuel panel
R and/or flight station) should malfunction or its accuracy be
R questioned, the amount of fuel on board should be verified
R by:

R (1) Refuel Panel Gauge or Flight Station Panel Gauge.

R (2) Fuel Level Sight Gauge.

R (3) Associated tank is emptied and refueled from a
R refueling source with a currently calibrated gauge.

R (4) Associated tank is emptied and refueled by transfer
R from another tank with an operative gauge.

R NOTE: The flight station indicator or the refueling
R panel indicator of the problem system is to be
R placarded until the problem is corrected. Then
R applicable placard is to be removed.

R B. If refuel panel gauge or flight station panel gauge is
R inoperative, use the following refueling method:

R (1) Follow all procedures and safety precautions that have
R been established to ensure airplane is in a safe
R configuration for refueling.

R (2) If refuel panel gauge is inoperative, the associated
R fuel quantity set bug will be inoperative. It will be
R necessary to monitor the operative flight station gauge
R during refueling and manually close fueling valve(s) by
R repositioning the control switch to closed when the
R desired fuel load is achieved.

R C. If the fuel quantity gauge is inoperative in the 2L or 2R
R tank and the fuel load specifies less than 11,000 pounds of
R fuel in the 2L/2R tank, there are three options.

R (1) Obtain a fuel release to increase the total fuel load
R to 64,000 pounds, which will provide a stickable
R quantity in the 2L/2R tanks. This option also has some
R significant fuel burn considerations.

R NOTE: This may not be acceptable due to maximum gross
R weight loading. Check with local Load Control
R or Dispatch.

R (2) Use truck meter for calculated add.

R (a) Transfer all fuel out of the tank with inoperative
R gauge into another tank. Record operative gauge
R reading on standard airline refueling form. If
R trip fuel quantity is reached in tank during
R transfer, add remaining fuel to another tank with
R an operative gauge.

R (b) Using the planned fuel distribution number,
R calculate the number of gallons required (pounds
R divided by specific gravity equals gallons) read
R truck meter and add calculated gallons to
R determine when desired quantity has been fueled.
R Record gallons actually pumped by truck on
R standard airline refueling form.

R (c) Fuel other tanks per the standard distribution and
R record on standard airline refueling form.

R (3) Transferring a known amount from another tank.

R (a) Transfer all fuel out of the tank with inoperative
R gauge into another tank. Record operative gauge
R readings on standard airline refueling form. If
R fuel quantity is reached in tank during transfer,
R add remaining fuel to another tank with an
R operative gauge.

R (b) Add the required amount of fuel from the tank with
R the inoperative gauge to a tank with operative
R gauge.

R (c) Transfer correct amount of fuel from the tank with
R the operative gauge into tank with the inoperative
R gauge.

R (d) Fuel other tanks per distribution and complete
R refuel form using standard procedures.

CR 4. C FUEL QUANTITY INDICATING SYSTEM - MAINTENANCE NOTES, DATA, TOLERANCES & REGULATIONS

C A. Fuel Quantity Indicating System - Trouble Shooting

C The following information outlines a work program for
C correction of fuel quantity system indication errors. An
C isolating chart is included that is to be used in directing
C corrective effort to the most likely area to minimize
C unproductive effort. For an alternate approach to fault
C isolation see Section 28-41-00, Fault Isolation.

C (1) No corrective action should be attempted on through
C flights with fuel quantity problems, unless required to
C meet aircraft dispatch regulations subject to Minimum
C Equipment List, other than fueling by dripsticks. Work
C is to be done primarily on layover aircraft.

C (2) Each station is to determine by checking aircraft logs
C which layover aircraft have fuel quantity problems.

C (3) The station should advise MCIMD coordinator of each
C aircraft with problem systems, giving all pertinent
C data required to fully describe the problem. The term
C indicator inop or in error is not sufficient
C information.

C (4) Deleted

C (5) The station will determine, according to its
C capability, which aircraft can be handled and will
C advise MCIMD of progress made on each problem worked.

C (6) All maintenance stations will be expected to contribute
C to the first phases of the trouble shooting effort.
C These stations can contribute by becoming sufficiently
C familiar with the fuel quantity system layouts to be
C able to locate connector plugs, wire connections,
C splices and components external of the wing. They can
C then visually monitor the indicator reading while these
C areas are tapped, flexed and reseated in an effort to
C duplicate the problem. No special test equipment will
C be required as the indicator can be very sensitive to
C the slightest wiring discrepancy.

C (7) Deleted

C (8) Stations that do not have facilities for entering tanks
C will not be expected to expend further effort on
C aircraft that have already had the trouble shooting
C check external of the tank performed twice without
C results unless specifically requested by MCIMD or

MCIEC. Due to the intermittent nature of most repetative problems, they may decide to have certain portions of all of the trouble shooting external of the tank done a second time.

(9) Aircraft that still have original problem after receiving a minimum of two trouble shooting checks external of the tank will receive preferential routing and scheduling to a major maintenance station for tank entry.

(10) Electronic Maintenance Engineering will work closely with MCIMD and Field Maintenance personnel to assist in resolving reported problems.

B. Wing Indicator Check Against Dripless Stick (Reference Note 11)

When fuel add and calculated add do not agree within the prescribed tolerance and no other indicator malfunction is noted, the logical procedure is to stick each tank to determine where the discrepancy occurs. See Paragraph 5 for push-to-test check. When pulling the sticks remember that accuracy of chart readings will be less than 90 percent, unless aircraft attitude is accounted for. Either level the aircraft or use appropriate out-of-level charts, (Ref. Chapter 12, Fueling) and determine which system is at fault. Placard indicator inop. and fuel by stick or proceed to correct indicator problem which is now established as being in that part of the system ahead of the signal conditioner, based on a "system OK" indication when the system test switch on the fueling panel was pressed. Reference Paragraph 5.

C. FE/SO Indicator Checked Against Stick (Reference Note 11)

On L-1011 aircraft the FE/SO indicator does not control the wing indicator. They both get their signal input from the signal conditioner. It will not be necessary then, as it is on other aircraft, to check FE/SO indicator condition to determine reason for a wing indicator being in error. A FE/SO indicator reported inaccurate or faulty in flight should be checked against the dripless stick when a system check shows it to be satisfactory.

D. Wing Indicator Calibration Checked

All of the fuel quantity system indicators on L-1011 aircraft are calibrated in the shop and should require no further adjustment on the aircraft. When an indicator has been found to be in error and its companion indicator (except totalizer) is operating satisfactorily the unit

C should be changed. Useful information can be obtained to
C aid in determining which indicator or signal condition, if
C any, is at fault by merely pressing the system test switch
C on the fueling panel. (A switch on the FE/SO panel performs
C the same function). First set the big pointer of each
C indicator to just below full. Now press the system test
C switch. All wing indicators and signal conditioners are
C operating satisfactorily if all indicators drive to a full
C scale reading and all fuel valves indicate closed. Any
C indicator that does not run to full and also close the
C fueling valve should be changed. This applies if either
C condition occurs separately. If, however, one indicator
C fails to drive to full and the fuel shutoff also does not
C occur, change the signal conditioner for that system.

C E. FE/SO Indicator Calibration Checked

C Field calibration is not required for any of the fuel
C quantity indicators on L-1011 aircraft. A good check can be
C made to isolate a faulty indicator or signal conditioner
C unit by pressing the system test switch on the FE/SO panel.
C Push the test switch and all tank indicators plus the
C totalizer should run to full scale. If any tank indicator
C reads less than full but the totalizer does read full, that
C tank indicator should be changed. If a tank indicator and
C the totalizer both read less than full change the signal
C conditioner of the low reading indicator. If all tank
C indicators read full but the totalizer reads less than full
C change the totalizer.

C F. Totalizer Calibration Checked

C The totalizer, like all other fuel quantity indicators does
C not require field calibration. To determine totalizer
C condition press the system test switch on FE/SO panel. If
C the totalizer drives to full scale while all tank indicators
C are also at full it is satisfactory. If all tank indicators
C drive to full but the totalizer reads less than full it
C should be changed.

C G. Indicator Changed

C Deactivate the fuel quantity indicating system when changing
C any indicator by pulling applicable circuit breaker.
C Reference Wiring Diagram Manual, Chapter 28 for C/B
C nomenclature and location. Reference the L-1011 IPC for
C Parts List covering all fuel quantity indicators, trim box
C and signal conditioners.

C H. Electrical Power Checked (Reference Note 4)

C Loss of electrical power to the fuel quantity system is
C readily apparent when a push-to-test check is made. An
C indicator malfunction, however, could be mistaken for loss
C of power or vice-versa. All indicators will emit a
C detectable hum when powered unless internally failed. If no
C hum is heard and the indicator appears "dead" check whether
C system circuit breakers are tripped, Reference Wiring
C Diagram Manual, Chapter 28, for C/B nomenclature and
C location. If all C/B's are in and an indicator change does
C no good, check for 115 volts A.C. to ground at the
C appropriate pin in the indicator connector plug. A check of
C the wiring diagram manual will reveal the correct pin to
C check.

C CAUTION: USE CARE WHEN CHECKING FOR POWER TO PREVENT COMING IN
C DIRECT CONTACT WITH THE HIGH VOLTAGE. USE A SIMPSON
C 260 METER (OR EQUIVALENT) AS A DETECTING DEVICE. DO
C NOT DEFORM THE FEMALE PINS IN INDICATOR PLUG WITH
C OVERSIZED PROBES. A No. 60 DRILL BIT OR PAPER CLIP
C WILL MAKE A SATISFACTORY PROBE.

C I. Signal Voltage to Wing Indicator Checked

C If the FE/SO indicator is found to be indicating correctly
C but the wing indicator is intermittently inaccurate or
C inoperative the problem may be a malfunction of the signal
C voltage to the wing indicator. Trouble shoot this area as
C outlined in Note 7 under NOTES.

C J. Signal Voltage to FE/SO Indicator Checked (Reference Notes
C 5, 6, 12, 14 and 15

C The most obvious indication of incorrect signal voltage to
C the FE/SO indicator is reports of sudden changes in
C indicator reading substantiated by a measurable difference
C between the indicator reading and a dripless stick check of
C the tank. Even though the indicator agrees with the stick
C check, it is reasonable to assume that a malfunction
C effecting the signal voltage occurred intermittently to
C cause the reported malfunction. If the problem is due to a
C poor shield or wire connection at a connector plug or
C splice, it may be made to duplicate (or clear-up) by moving
C the wiring at these points, or reconnecting the plugs. Any
C change in continuity in these areas will be immediately
C noted at the indicator by a change in the reading. Even
C very small changes will start the indicator motor driving or
C change pitch of the hum emitted. Two mechanics can
C effectively check condition of the fuel quantity system at
C any point in the wiring and unit location by first providing
C themselves with portable two-way communication. One man
C will monitor the indicator and immediately report any
C changes in indication or motor noise while the second man

C disturbs the wiring and/or various components in the system
C by flexing the wiring at connectors and splices.

C K. Indicator Plug Checked

C Due in part, to past abuse during checks for condition and
C frequent removal/installation on indicators during hook-up
C of test equipment, the indicator plugs may provide less than
C optimum connection of system wiring to the indicator. With
C the plug connected and the system powered, gently flex the
C wiring where it enters the plug. Pull each wire gently and
C twist it slightly in each direction. Any change in tone of
C the indicator motor indicates an undesirable change in
C continuity in the plug. With power off, remove the plug and
C visually check for pin and shield damage. (The shield
C surrounds one of the pins). Use a standard paper clip made
C of .035" dia. wire or use No. 60 drill bit and check grip of
C each female pin in the plug. The grip should be noticeable
C and support the clip in suspended position while plug is
C tapped. Do not use oversized objects to check pins. This
C will damage them and generate future problems.

C On L-1011 aircraft the signal voltage to the FE/SO and wing
C indicators comes directly and separately from the signal
C conditioner. The signal to the signal conditioner comes
C directly from the variable capacitor trimmer unit. These
C units are all located in a group on the aft bulkhead of the
C mid electrical service center. The signal into the trimmer
C unit comes directly from the tank probes in the tank. By
C reference to the appropriate wiring diagram manual page in
C Chapter/Section 28-41 the signal lead can be traced thru the
C various units and connector plugs from indicator to tank
C receptacle for any evidence of intermittent and faulty
C connection. These areas are not expected to give any
C trouble unless miss handled during trouble shooting or unit
C changing.

C L. Wing Feed-Thru Connector Checked

C The last break in system wiring outside the tank is at the
C various wing spar feed-thru connectors. They will be found
C in the wing front spar area outboard of the MESC and system
C entry to each tank is thru a single rectangular receptacle.
C Check wing receptacle pins and insert interface for signs of
C being pushed back. The interface material should be
C reasonable flush with the edge of the receptacle flange.
C All pins should be equidistant from a straight edge placed
C across flange. Check pin grip with No. 60 drill bit or
C standard paper clip made of .035" dia. wire. With plugs
C connected and system energized, check for intermittent
C indication when wires are gently pulled-pushed and moved and

C when assembly and front spar immediate area are tapped
C moderately.

C M. REFERENCE NOTES (Ref. Figure 201)

C (1) The wing indicator is used when fueling aircraft unless
C the indicator is inoperative or placarded in error. On
C aircraft whose wing indicators are malfunctioning, the
C FE/SO indicator will be used when fueling.

C (2) An indication error is considered major if at least 10
C percent of full scale or greater. Errors below 10
C percent are considered minor.

C (3) Internal malfunction or failure of the indicator will
C be confirmed during push-to-test check. Change
C indicator to correct. Reference Paragraph 5 and 6.

C (4) If indicator change does not correct major error, there
C may be a power loss. Check all fuel quantity
C indication system circuit breakers for a tripped
C condition. Reset after changing applicable indicator.
C If circuit breaker re-trips, refer to copy of
C applicable wiring diagram of system and check wiring
C for a short. If circuit breakers are all in but no
C voltage appears at appropriate pin on indicator plug,
C check power lead back to circuit breaker for loss of
C continuity. Reference wiring diagram of fuel quantity
C system, Chapter 28.

C (5) Most indicator errors are due to incorrect signal
C voltage applied to the indicator. The signal voltage
C for both FE/SO and wing indicators is developed across
C the combined capacity of the tank probes. Minor errors
C in the A.C. voltage can occur in numerous ways. A
C small drop in signal voltage will occur if capacity of
C one probe is lost, as from loss of continuity through
C the probe leads. A rise in signal voltage of similar
C proportions will occur if continuity to one probe
C shield is lost. This doubles that probes' capacity.
C Minor errors, either high or low, will occur if one or
C more probe is incorrectly installed. A small chronic
C error can also be caused by installation of the wrong
C P/N probe or indicator. This has already occured
C several times on other aircraft. If work has
C previously been done in the tank it will pay to check
C the Equipment List or IPC Manual when there is doubt of
C the correct part.

C (6) A major indicator error may be due to a large error in,
C or loss of, signal voltage. Most repetitive indicator
C malfunctions are major in nature and due to signal

C voltage errors are due to wiring problems. Water
C contamination in the tank causes major errors also.
C Occurrence is not common but can be expected.

C See Flag Notes 14 and 15. Loss of shield continuity to
C ground of the shielded lead signal wire causes the
C total signal to more than double. Grounding of the
C shielded lead signal wire makes the indicator appear
C dead.

C An open shielded lead signal wire causes indicator to
C drive to empty stop.

C External of the tank, look for loss of shield-to-ground
C continuity. The shield must be grounded at only one
C point. Connection to ground is made at the indicator
C receptacle. With the indicator plug removed, the
C shield should be isolated from ground. If the
C capacity, measured on an MD-2 Tester, is unusually
C high, the shield is probably ungrounded.

C The problem may be in the indicator plug or connection
C to the wing spar receptacle. After wiring,
C connections, and other components external of the wing
C have been carefully checked for cause of signal
C malfunction, a tank entry will be required.

C (7) Loss of signal to the wing indicator by shorting of the
C signal lead will cause both the wing and FE/SO
C indicators to appear dead. An open signal will effect
C only the wing indicator. On push-to-test it will not
C move while the FE/SO indicator drives to full.
C Changing indicators will do no good.

C (8) All fuel quantity indicators on the L-1011 are
C calibrated in the shop and should require no additional
C adjustment on the aircraft. If an indicator is found
C to be out of adjustment it should be changed. No
C attempt should be made to calibrate any indicator. The
C only calibration that is recommended on the aircraft is
C adjustment of tank probe capacities to a predetermined
C value by use of the tank trimmer capacitors in the
C variable trimmer unit. This is to be done only with
C the tank completely empty and with the MD-2 Tester
C connected.

C (9) Totalizer should indicate the sum of all individual
C FE/SO indicators within 1 percent of its full scale
C indication capability. If, during system test at the
C FE/SO panel, the totalizer reads less than full when
C all tank indicators have driven to full it should be
C changed.

C (10) If fuel quantity indication malfunction reported
C by the flight crew still exists after aircraft has
C landed and parked, all trouble shooting should
C follow same pattern as when FE/SO indicator is
C reported in error during fueling. Ref. Chart -
C Sheet 1.

C (11) The wing indicator accuracy must be confirmed by
C stick before being used if the FE/SO indicator has
C been reported inaccurate in flight. Placard the
C indicators accordingly until corrections have been
C made.

C Determine fuel in tank on arrival by a careful dripless
C stick check. It is preferrable to level aircraft and
C use zero inclination charts Ref. Chapter 12 - Fueling.

C (12) Occasionally an indicator will appear to go zero
C during flight. It can be caused by an
C interruption of AC input power to the indicator or
C grounding of the shielded wire input signal
C voltage lead from the probes (or signal
C conditioning box). An internal hand-up of the
C indicator may also occur with the same result. If
C the system returns to normal later in flight, the
C above possibilities are the expected problem
C areas. Most of the trouble area is external of
C the tank and all external circuitry should be
C carefully checked before checking in the tank.

C (13) Reports that fuel quantity indication drives
C upward and reads high in-flight but returns to
C normal before landing represent a major portion of
C the long standing repetitive problems that plague
C our aircraft. There are two obvious causes of
C this to consider.

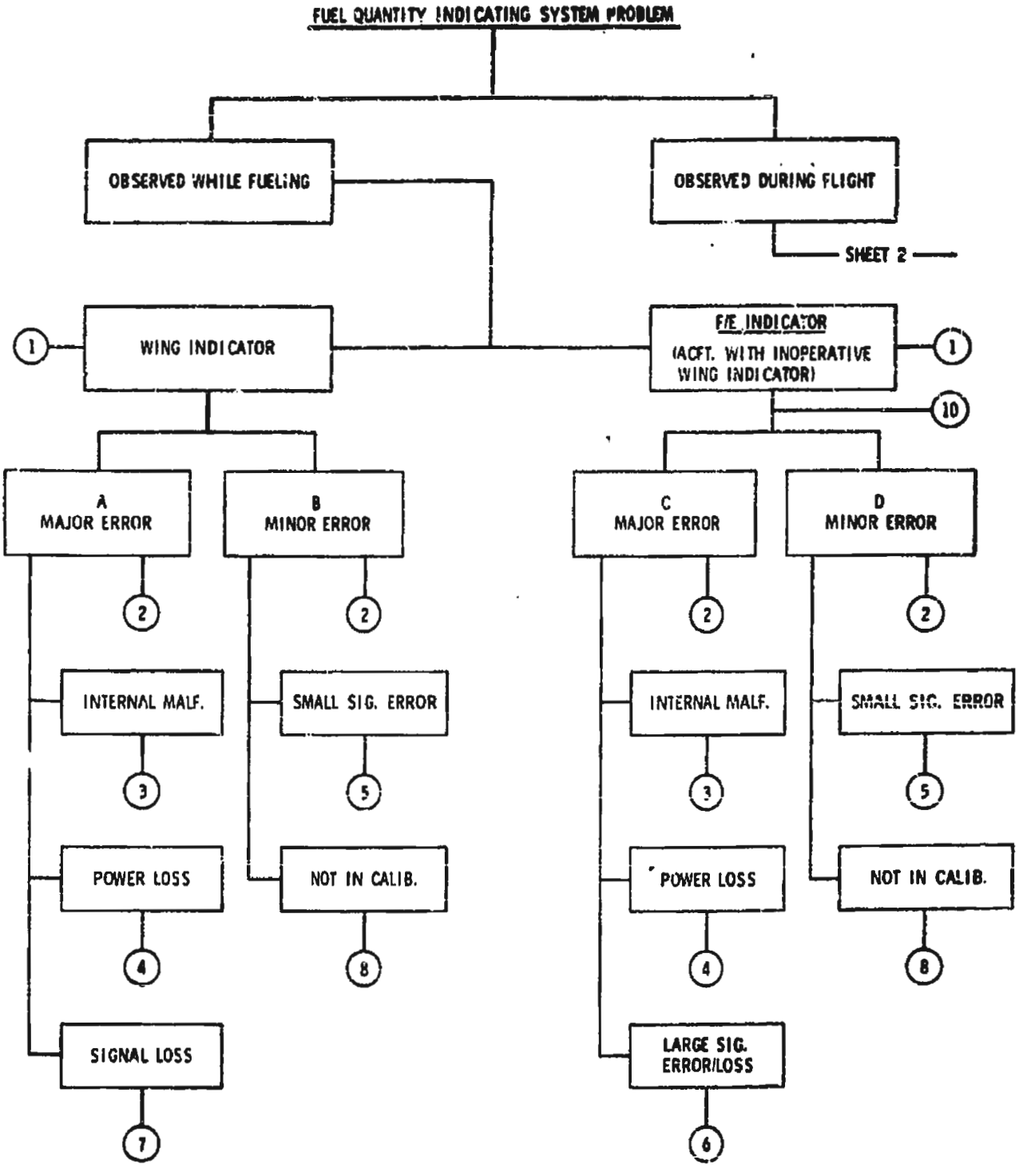
C There is either a loss of signal voltage or an increase
C in signal voltage through the tank probes. Most of the
C reasons for this have been discussed in Flag Notes 5
C and 6, however, the clue as to why this occurs only or
C mostly in-flight must be associated with large
C temperature changes that can cause probe internal
C continuity to break down, or ice to form in
C feed-through assemblies that force interfaces apart, or
C is associated with movement of trapped water to
C vicinity of probes, or is due to vibration, wing
C flexing or the sloshing of fuel affecting poor wiring
C connections.

C Most of these problems obviously will be found in the
C tank but could also occur at the wing feed-through

C connectors or interconnect splices when they are used
C in the wing wiring. These areas should be checked
C prior to entering the tank. The wing spar rectangular
C feed-through assemblies should be checked carefully for
C signs that pins have not pushed back. If the complete
C insert assembly is pushed back, it will be necessary to
C replace the entire tank harness. After this area has
C been thoroughly checked and found in satisfactory
C condition, the most likely problem area is inside the
C tank. If the reported problem occurs during take-off
C or early part of flight, suspect a loose connection or
C possible water contamination shorting a probe. If the
C problem occurs late in flight, it may be due to
C internal breakdown of continuity to shield in one of
C the probes. After a visual check of all wiring
C connections in the tank have been made, a one-time
C change of all probes, is recommended when nothing
C previously has been found wrong.

C (14) When the problem is reported as driving down to a
C lower reading in flight, it is basically due to
C the indicator receiving a signal voltage that
C momentarily or periodically drops to a lower
C value. This can be due to loss of signal across
C one or more tank probes which might occur because
C of poor probe connections being effected by
C vibration, sloshing of fuel or thermal
C contraction. It could be due to partial or
C complete loss of the low Z voltage being applied
C to the probes from the indicator.

C This would occur at any point where the low Z
C unshielded wire either leaked or shorted to ground or
C lost continuity. This area should be checked carefully
C at all points external of the tank before deciding the
C problem is in the tank. The major cause of excessive
C signal voltage is water contamination bridging across
C the dialectric between the two plates. problems early
C in flight, while tanks are full or while taxiing, could
C be due to this. The problem is especially prevalent
C during fueling of the aircraft.



NOTE

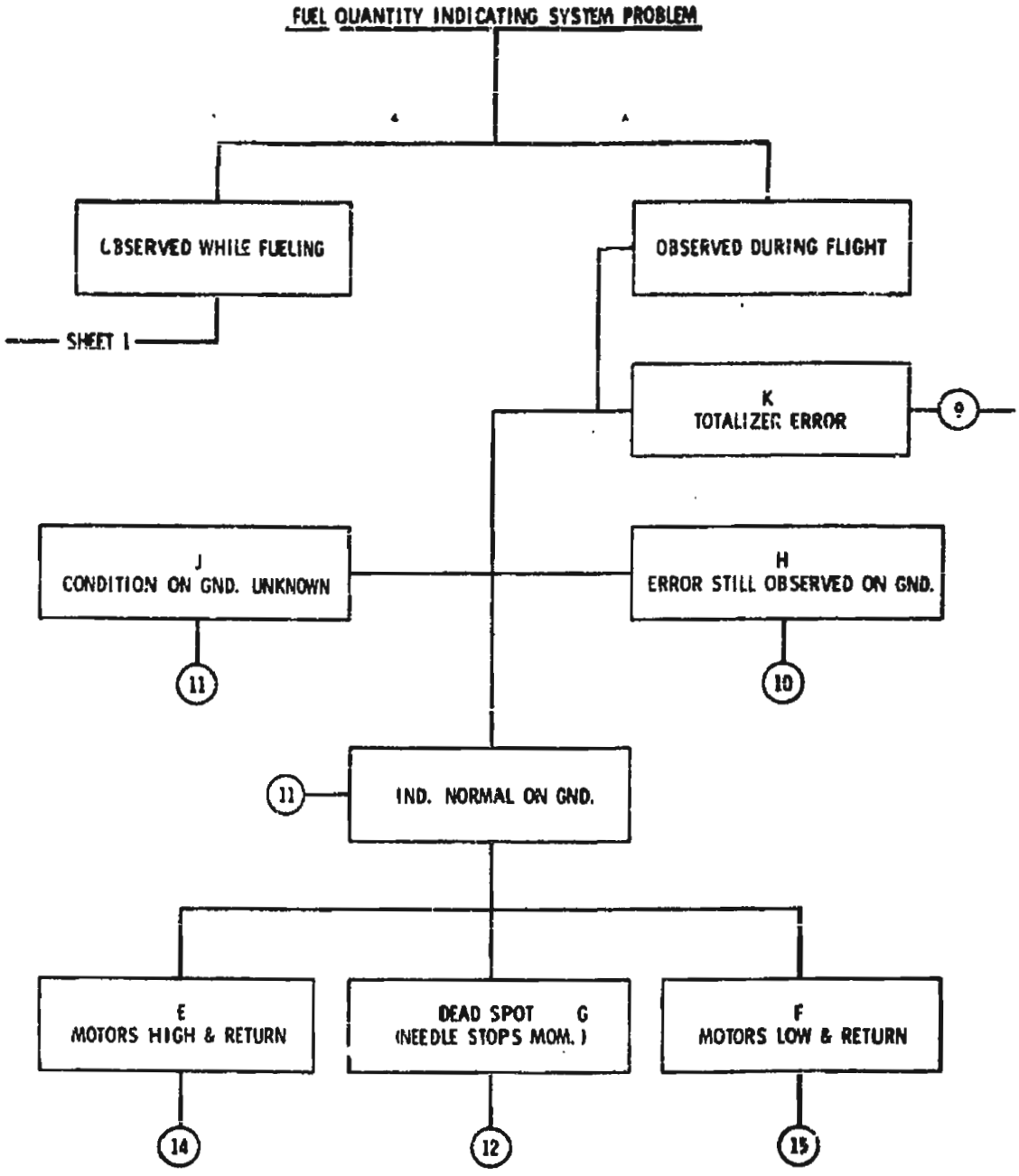
(○) INDICATES REFERENCE NOTE

REV. 17

MI-5000-28-1523

C
C Trouble Shooting Isolation Chart
Figure 201 (Sheet 1 of 2)

R EFFECTIVITY: ALL
R
003B



REV 17

M1-5000-28-1324

C
C

Trouble Shooting Isolation Chart
Figure 201 (Sheet 2 of 2)

R EFFECTIVITY: ALL
R
003B

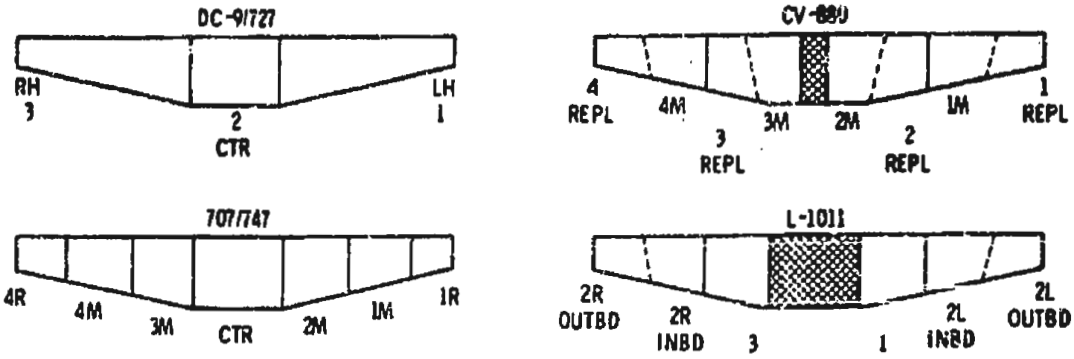
FORM M-1864 8/73

AIRCRAFT: _____ DATE RECORD STARTED: _____

PROBLEM: _____

_____

SYSTEM:



PROBLEM CATEGORIES

SEE TROUBLE SHOOTING ISOLATION CHART FOR REFERENCE TO APPLICABLE NOTES.

OBSERVED DURING FUELING

A. ☐ MAJOR ERROR (10% OR GREATER) OBSERVED ON WING INDICATOR DURING FUELING.

B. ☐ MINOR ERROR OBSERVED ON WING INDICATOR DURING FUELING.

C. ☐ MAJOR ERROR OBSERVED ON F/E'S INDICATOR DURING FUELING.

D. ☐ MINOR ERROR OBSERVED ON F/E'S INDICATOR DURING FUELING.

OBSERVED DURING FLIGHT - NORMAL ON GROUND

E. ☐ MOTORS HIGH THEN RETURNS TO NORMAL AND NORMAL ON GROUND.

F. ☐ MOTORS LOW THEN RETURNS TO NORMAL AND NORMAL ON GROUND.

G. ☐ NEEDLE DOES NOT MOVE DURING PART OF FLIGHT BUT IS NORMAL ON GROUND.

OBSERVED DURING FLIGHT - ERROR STILL EXISTS ON GROUND

H. ☐

OBSERVED DURING FLIGHT - CONDITION ON GROUND UNKNOWN

J. ☐

TOTALIZER ERROR REPORTED

K. ☐

C
C Fuel Quantity Malfunction Work Record
Figure 202 (Sheet 1 of 2)

R EFFECTIVITY: ALL
R
003B

FORM M-1864 8/73

WORK SEGMENTS	PROBLEM CATEGORIES A	B	C	D	E	F	G	H	J	K	NO	HE
1. WING INDICATOR CHECKED AGAINST DRIPSTICK			X	X	X	X	X	X	X	X		
2. F/E INDICATOR CHECKED AGAINST DRIPSTICK					X	X	X			X		
3. WING INDICATOR CALIBRATION CHECKED	X		X	X	X	X	X	X	X	X		
4. F/E INDICATOR CALIBRATION CHECKED			X		X	X	X			X		
5. CORRECT P/N INDICATOR INSTALLED	X		X		X	X	X	X	X			
6. TOTALIZER CALIBRATION CHECKED	X	X	X	X	X	X	X	X	X			
7. INDICATOR CHANGED		X	X	X								
8. ELECTRICAL POWER CHECKED		X		X	X	X	X					
9. SIGNAL VOLTAGE TO WING INDICATOR CHECKED			X	X	X	X	X	X	X	X		
10. SIGNAL VOLTAGE TO F/E INDICATOR CHECKED					X	X	X			X		
11. INDICATOR PLUG CHECKED												
12. SHIELDED WIRE SPLICES BEHIND F/E PNL CKD (880/707)										X		
13. TRIM CAPACITOR BOX BELOW F/E TABLE CKD (707)										X		
14. 1ST PROD. CK. BEHIND F/E PANEL CKD (727)										X		
15. 2ND PROD. CK. AT STATION 700 CKD (727)										X		
16. SHIELDED WIRE SPLICES AT 620 STA. CKD (707)										X		
17. TRANSFER BOX AND CONNECTORS CKD (880)										X		
18. WING FEED-THRU CONNECTORS CKD										X		
WORK DONE INSIDE THE TANK												
19. LOCATION AND P/N OF PROBES CHECKED	X		X		X	X	X			X		
20. ALL PROBE CONNECTIONS INCL. SHIELD PIGTAILS CKD										X		
21. ALL COMPENSATOR CONNECTIONS CKD										X		
22. WATER IN BOTTOM OF TANK CONTACTING PROBES/COMP					X	X	X			X		
23. PROBES CHGD (ALL OR IN PROGRESSIVE GROUPS)										X		
24. COMPENSATOR CHANGED										X		
25. FUEL TANK HARNESS CHANGED										X		

REV. 17

M1-5000-28-1526

C C Fuel Quantity Malfunction Work Record
Figure 202 (Sheet 2 of 2)

R EFFECTIVITY: ALL
R
003B

C FUEL QUANTITY INDICATION SYSTEM - SERVICING

C 1. General

CR The Procedures covering use of fuel level sight gages are in
CR Chapter 12 of this manual.

R FUEL QUANTITY INDICATING SYSTEM - ADJUSTMENT AND TEST

R 1. General

R A QUANTITY TEST switch on the Flight Engineer/Second Officers
R FUEL SYSTEM panel, a GAUGES TEST switch on the right wing
R fueling/defueling panel, and SYSTEM TEST switches on tank 1 and
R 3 signal conditioners in the MESC, provide a means of
R operationally checking the fuel quantity system. All four
R switches are electrically in parallel and will produce identical
R system response. When either switch is closed, a simulated full
R tank signal is internally applied to each signal conditioner
R fuel quantity measurement channel. Test results are indicated
R by all fuel quantity indicators, including the totalizer,
R driving upscale to full tank indications. Since fuel system
R panel totalizer indicator readout is a summation of separate
R full tank input signals applied to each flight station
R indicator, a totalizer, or indicator, that does not drive
R upscale is faulty. A fault in fuel quantity indicator input
R signal circuitry (signal conditioner, interconnect wiring) is
R indicated if any one indicator and totalizer do not drive
R upscale.

R System operational checkout procedures (Ref. Para. 4A) include
R testing the indicators using both FUEL SYSTEM panel QUANTITY
R TEST and fueling/defueling panel GAUGES TEST switches. Built-in
R test (BITE) provisions incorporated on the signal conditioner
R units enable onboard checking of component operation and
R isolation of malfunctioning units.

R BITE provisions include pushbutton BITE switches on each signal
R conditioner, push-to-test JETTISON light switches on the tank 1
R and 3 signal conditioners, and push-to-test JETTISON and SUMP
R light switches on tank 2L and 2R signal conditioners (Ref. Fig.
R 501).

R The above push-to-test switches, when used in conjunction with
R signal conditioner SYSTEM TEST switches, provide a means of
R separately checking those portions of fuel level sensing
R thermistor circuitry located within and external to the signal
R conditioners. Analysis of the push-to-test light indications
R will isolate a fault to a signal conditioner or respective tank
R thermistor circuit.

R In general, pressing a SYSTEM TEST switch checks all signal
R conditioner push-to-test switches for faulty lamps and drives
R all fuel quantity indicators upscale, thus checking the system
R between signal conditioners and indicators.

Pressing a SYSTEM test switch and a signal conditioner push-to-test JETTISON, or SUMP (Low Level) light switch at the same time tests the associated fuel level sensing thermistor circuit. If a light goes out, the thermistor, or thermistor wiring, is either shorted or open or there is a fault in the signal conditioner. Pressing a BITE switch and one of the above light switches at the same time checks that particular thermistor signal processing circuit in the associated signal conditioner. If a light does not come on, a fault in the signal conditioner is indicated.

If there is not enough fuel in the tank to cover the low fuel level sensing thermistor, the SUMP light should come on when only the push-to-test SUMP switch is depressed. Similarly, the JETTISON light should come on (in 3.0 ± 2.0 seconds) when there is enough fuel in the tank to cover the jettison stop thermistor and only the JETTISON push-to-test switch is depressed.

CR If the SYSTEM test checks confirm that indicator and signal
CR conditioner circuits are functioning properly, then a fault in
CR fuel quantity indication must be in one or more of the tank
CR probes or harnesses. Total probe and harness capacitance
CR measurements with the tank emptied will verify a probe or probe
CR wiring malfunction. The location of this fault can be further
CR isolated to an individual probe by measuring probe capacitance.

CR Signal conditioners and fuel quantity indicators are bench
CR adjusted to provide zero fuel (empty tank) indications for a
CR predetermined dry fuel probe and harness input signal
CR capacitance. Calibration on the aircraft is then limited to
CR adjustment of a probe or harness trimming capacitance in a
CR variable capacitor trimmer unit (VCTU) to compensate for
CR component tolerance build-up and installation effects that would
CR affect fuel gage indication of actual fuel quantity in the tank.

CR Calibration of the fuel quantity indicating system is
CR accomplished by adjusting six variable capacitors located in the
CR variable capacitor trimmer unit (VCTU). The procedure (done
CR with tanks empty) sets each of the FE/SO fuel gages to an empty
CR tank indication by adjusting (or trimming) the probe and harness
CR capacitance applied to the associated fuel quantity signal
CR conditioner. An alternate method, adjusts the probe and harness
CR capacitance to the predetermined nominal value that should
CR produce an empty fuel gage indication.

A health monitor check is included to determine if any adverse condition in the fuel tanks, such as micro-biological contamination, moisture, or fuel additives, is degrading transmitter probe performance.

2. Equipment and Materials

Volt-ohmmeter, Simpson Model 260, or equivalent

C Test Set, R & R 90068

C MD2 Test Set, R & R 90069

C Gull, R & R 90225 - Test Set - Fuel Quantity System, P/N
C 361-016-001

C 28-41-22-0022 Fuel Quantity Test Harness

C EQ-1158 Fuel Quantity Test Harness (or equivalent)

C 28-41-17-0006 Fuel Quantity Test Harness, P/N 248-3014 (or
C equivalent)

C NOTE: When equivalent equipment is used, it must perform
C maintenance manual task. If additional instructions are
C required, they must be provided locally.

C PN-TBD L-1011 Fuel Quantity Trimmer By-Pass Tester.

3. Referenced Procedures

	12-11-03	Fuel Level Sight Gages - Servicing
	12-11-11	Underwing Pressure Fueling - Servicing
	24-00-00	Electrical Power - Maintenance Practices
	28-22-00	Defueling - Maintenance Practices
R	28-41-00	Fuel Quantity Indicating System - Fault Isolation
	28-41-01	Fuel Quantity Probe - Removal and Installation

4. Adjustment/Test

A. Operational Test

(1) On the galley right circuit breaker panel, zone 130, verify that the following circuit breakers are closed:

FUEL SYS GA RPTR IND (A15)

DEFUELING CONTROL PWR (H16)

FUELING VALVE TEST (H17)

FUELING VALVES (H18)

REFUEL PWR CONT (H19)

REFUEL ALTN POWER (G20)

On the galley left circuit breaker panel, zone 130, verify that circuit breaker DC BUS - PWR REFUELING (B21) is closed.

On the FE/SO aft circuit breaker panel CB3, zone 215, verify that the following circuit breakers are closed:

FWD AC GND SVCE BUS (Z11)

FUEL QTY IND - TEST, 1, 2L, 2R, and 3 (T1 through T5)

(2) Apply external electrical power (Ref. 24-00-00).

(3) On Flight Engineer/Second Officers FUEL SYSTEM panel, zone 215:

(a) Verify that REFUEL POWER ON light is not on. If on, momentarily depress switchlight to relax solenoid held SYSTEM POWER switch on right wing fueling/defueling panel. ON light must go out.

(b) Perform panel lights test to verify operational status of indicating light lamps (Ref. 33-17-00).

NOTE: Depending on aircraft attitude, 2L INBD or 2R INBD LOW light may be already on if fuel level in respective tank is below the low fuel level sensing thermistor (approx. 700 lbs/318 Kg).

(4) Record tank 1, 2L, 2R, and 3 fuel quantities. Verify that totalizer counter agrees with total fuel displayed by indicators.

NOTE: If tanks are empty, fuel quantity indicators shall read 0± 100 lbs (0 ± 50 Kg).

(5) Hold QUANTITY TEST switch depressed. Verify that all four quantity indicators, and totalizer counter, drive upscale to the following indications.

TANK	INDICATION
1	54,000 ± 600 LBS (24,500 ± 275 KG)
2L	27,000 ± 300 LBS (12,250 ± 125 KG)

TANK	INDICATION
2R	27,000 ± 300 LBS (12,250 ± 125 KG)
3	54,000 ± 600 LBS (24,500 ± 275 KG)
TOTALIZER	162,000 ± 1620 LBS (73,500 ± 750 KG)

(6) Release QUANTITY TEST switch. Verify that all indicators drive downscale to previous reading.

(7) Depress (latch) 2L INBD, and 2R INBD switchlights. Verify that the QTY light in each switchlight comes on and that the fuel quantity indicator pointers move to a position indicating the amount of fuel in inboard
C sections of tank 2L and 2R (Reading will decrease if 2L
C or 2R outboard has fuel in tank).

NOTE: The QTY light only indicates switch position.

(8) Depress (release) the switchlights. Verify that QTY lights go out and quantity indicators return to previous reading.

(9) At the right wing fueling/defueling panel, zone 621, place SYSTEM POWER switch to ON position. Verify that REFUEL POWER light on flight station FUEL SYSTEM panel comes ON.

(10) Verify that all panel lights (if not already on) come on when LIGHTS TEST switch is held in TEST position.

(11) Record tank 2L, 2R, 1, and 3 fuel quantity indications. Verify that these readings agree with corresponding indicators on flight station FUEL SYSTEM panel.

C NOTE: Cockpit and wing indicators shall agree ± 100
C lbs.

C (12) Observe four SET POINT TEST lights and fuel cutout
C index positions. Tank 2L 1, 3, and 2R SET POINT TEST
C lights must be on if bug is set higher than the
C indicator pointer.

R (13) Set fuel cutoff indexes on 2L, 1, 3, and 2R indicators
R at approximately midscale (or higher than pointer).

R (14) Hold GAUGES TEST switch actuated. Verify that each
R fuel quantity indicator drives upscale to positions

CR noted in Step 4A(5). Verify SET POINT TEST lights go out when switch is actuated.

C (15) Release test switch. Verify that all indicators
C continue to drive downscale to previous reading.

(16) Depress REFUEL POWER switch. Verify that ON light goes out. At right wing fueling/defueling panel, verify that SYSTEM POWER switch has released to the OFF position and that fuel quantity indicators display the amount of fuel in the respective 2L, 1, 3, and 2R tanks.

B. SYSTEM Test and BITE Check

NOTE: Significance of signal conditioner SUMP and JETTISON lights during these tests is affected by whether fuel level sensing thermistors are uncovered or submerged in fuel. Therefore, before doing SYSTEM test and BITE check, determine amount of fuel in tank 1, 3, and 2L/2R surge box areas.

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, verify that the FUEL QTY IND - TEST, 1, 2L, 2R, and 3 circuit breakers (T1 through T5) are closed.

(2) At flight station FUEL SYSTEM panel, verify that the FUEL JETTISON panel MASTER switch is unlatched (OPEN light out), and all four DUMP switches are unlatched (DUMP lights out). Verify that all boost pumps are off (not operating).

(3) In the MESC, zone 137, alternately depress SYSTEM test switch on tank 1 and 3 signal conditioners (Ref. Fig. 501). Verify that the green push-to-test lights on each signal conditioner come on.

NOTE: This check verifies that the green push-to-test switch lamps are operational. The test will also drive all fuel quantity indicators upscale
C as noted in Steps 4A(5) and 4A(14), and both low
C level lights come on thus verifying the fuel quantity measurement circuitry between the signal conditioners and fuel quantity indicators.

C (4) On applicable signal conditioners, alternately push
C jettison and sump push-to-test light switches while

C holding the SYSTEM test switch pressed in. Verify that each green light comes on.

NOTE: There is a 3.0 (±2.0) second delay before a JETTISON light will come on.

If either of the above lights do not come on, an open or short in the applicable signal conditioner fuel level sensing thermistor circuitry or thermistor wiring is indicated.

(5) Release SYSTEM test switch.

(6) Simultaneously depress signal conditioner BITE test and SUMP push-to-test light switches. The SUMP light must
C come on (only 2L and 2R signal conditioners).

NOTE: The above test checks the internal signal conditioner low fuel level signal processing circuits by simulating an uncovered SUMP thermistor. If the test results are not as noted, a fault in the signal conditioner is indicated.

If the thermistor is not submerged, the SUMP light will come on when only the SUMP light push-to-test switch is depressed. (Depending on aircraft attitude, SUMP (low fuel level sensing) thermistor will be immersed when 2L/2R inbd tank fuel quantity is more than 700 lbs/318kg).

C (7) Simultaneously depress signal conditioner JTSN
C push-to-test light and BITE test switches. Verify that the JTSN light comes on.

NOTE: There is a 3 (±2) second time delay before the JTSN light comes on.

Depressing the BITE switch inserts a simulated wet (submerged sensor) jettison level input signal to the signal conditioner jettison control circuitry. If test results are not as noted, a fault in the signal conditioner is indicated.

If tank 1 and 3 fuel is more than 4000 lbs/3630kg, and tank 2L/2R inboard section fuel is more than 800 lbs/363kg (sufficient to submerge the jettison stop thermistor) the JETTISON light will come on when only the JETTISON push-to-test switch is depressed.

C. Health Monitor Check

(1) Verify that the circuit breakers listed in Step 4A(2) are closed.

(2) Turn on electrical power (Ref. 24-00-00).

(3) On aircraft 001-023, in the MESC, zone 137, measure the dc voltage at terminal board 2841-TB3 (terminal strips noted below). Verify that the measured voltage is less than 4.0V dc.

C (4) On aircraft 024 and 027, in the MESC, zone 137, measure the dc voltage at terminal board 2841-TB4 (terminal strips noted below). Verify that the measured voltage is less than 4.0V dc.

Tank 2L	Terminal Strip 13
Tank 1	Terminal Strip 11
Tank 3	Terminal Strip 12
Tank 2R	Terminal Strip 14

C 5. Individual Fuel Tank/Probe and Harness Capacitance Check

C NOTE: The following procedures may be used to test individual C fuel tank/probes for proper capacitance and insulation C resistance values.

C Since probe and harness capacitances are quoted for empty C tank conditions, steps must be taken to assure that no C probe (or probes) to be checked is immersed in fuel. C This can be done by draining the tank to a level that C will assure that all probes are clear of fuel.

C A. Individual Tank Probe Capacitance

C (1) If probes in left wing tanks are to be checked, C disconnect wiring harness plug 2899-P1; if probes in C right wing are to be checked, disconnect harness plug C 2899-P2.

C (2) Connect test harness connectors to MD-2 or Gull tester; C to applicable 2899-( ) plug; and to variable capacitor C trimmer (Ref. Fig. 502).

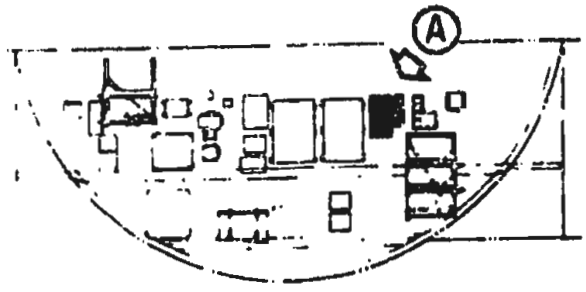
C (3) Perform preliminary adjustments to MD-2 or Gull test C set in accordance with test set operating instructions.

C (4) Actuate applicable fuel tank selector switch, then position tank probe switch to each probe position. Verify probe capacitance is as noted in Table 501.

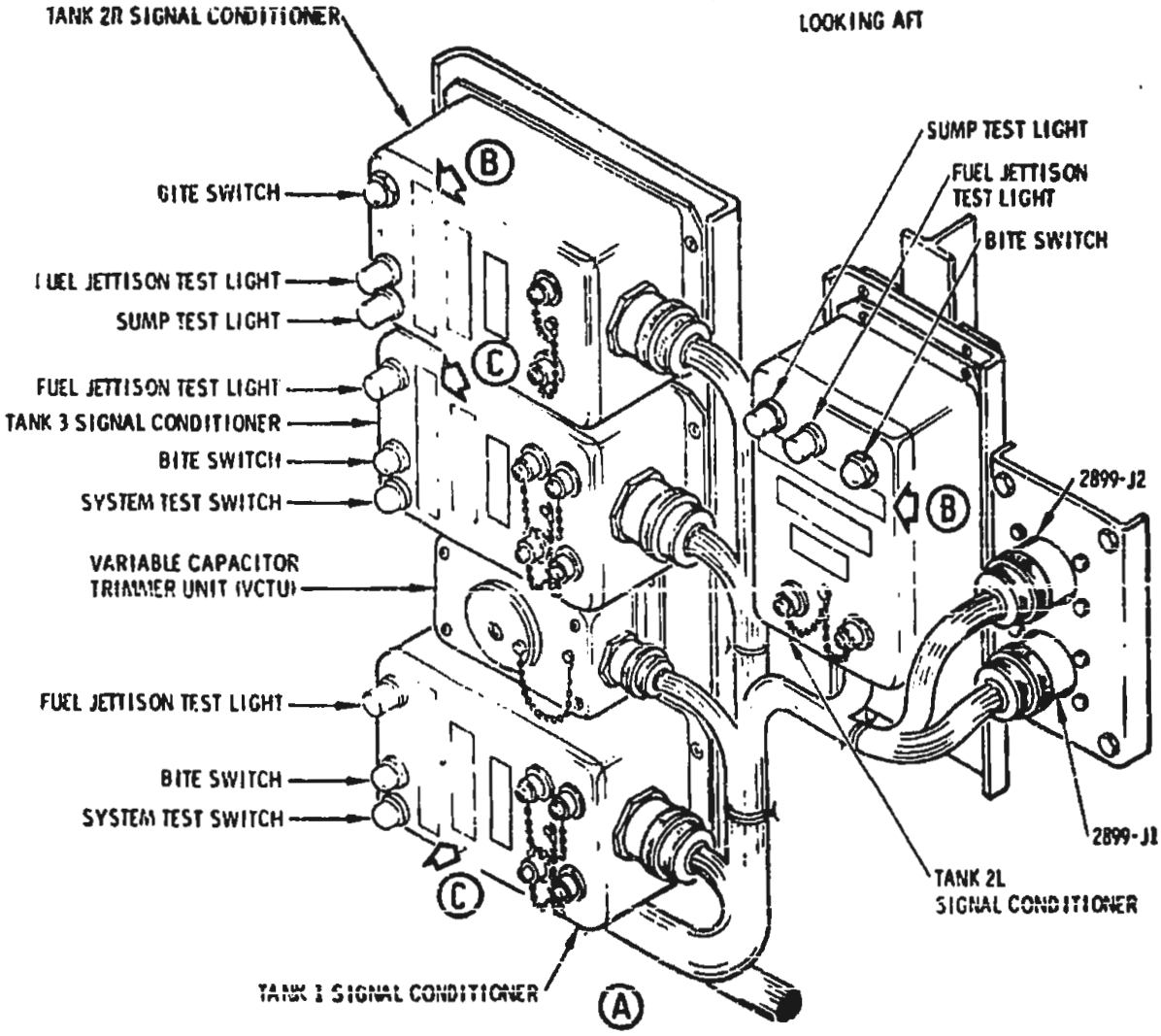
NOTE: If results are not as noted in Table 501, replace defective probe or make the required repairs to restore probe capacitance to Table 501 values.

C (5) Remove test equipment and reconnect aircraft wiring harness to appropriate connectors.

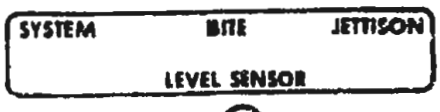
C (6) Check system operation (Ref. Para. 4A).



MID ELECTRONIC SERVICE CENTER
LOOKING AFT



B



C

M1-0000-28-1413

C Fuel Quantity Signal Conditioners
C Figure 501

R EFFECTIVITY: 001-024
R

005B

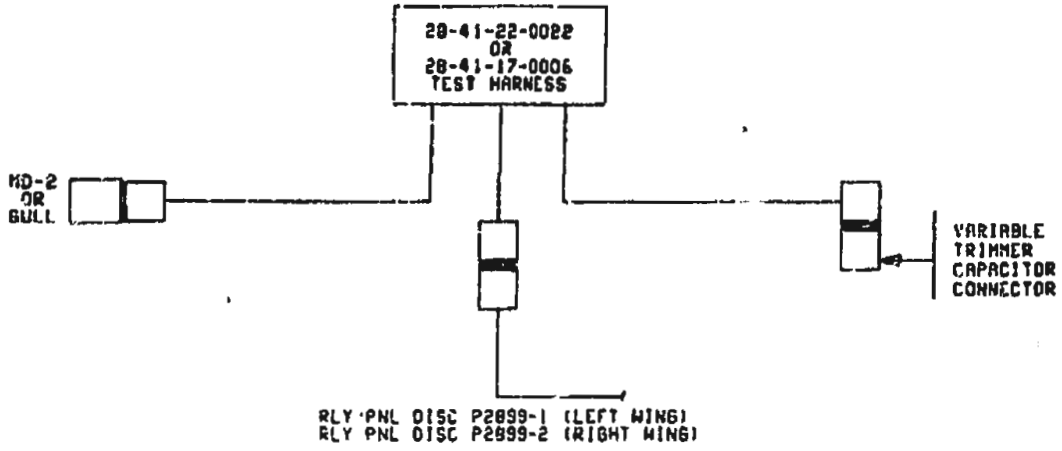


FIGURE 502A

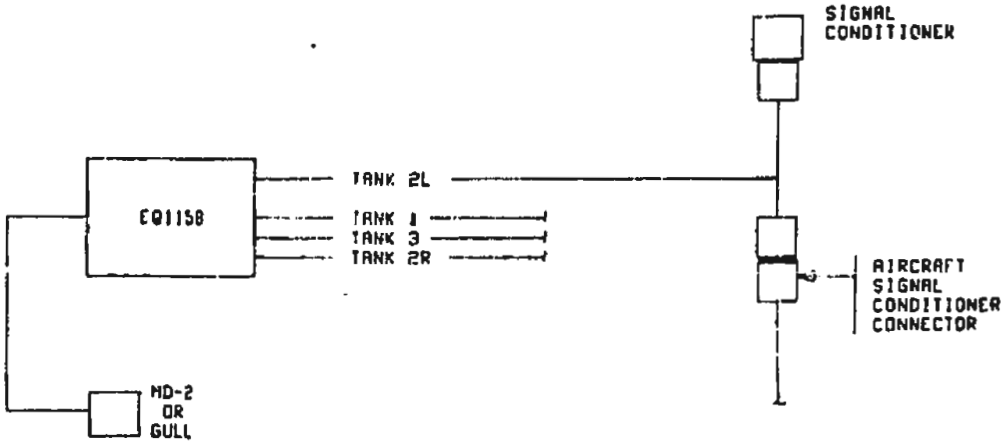


FIGURE 502B

M1-0000-28-1631

CR Test Harness Installation
CR Figure 502 (Sheet 1)

EFFECTIVITY: 001-024, 027

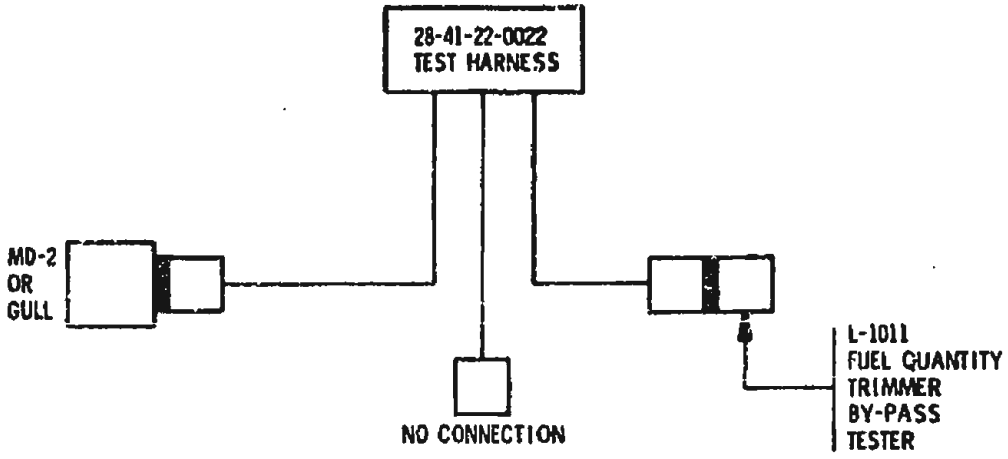


FIGURE 502C

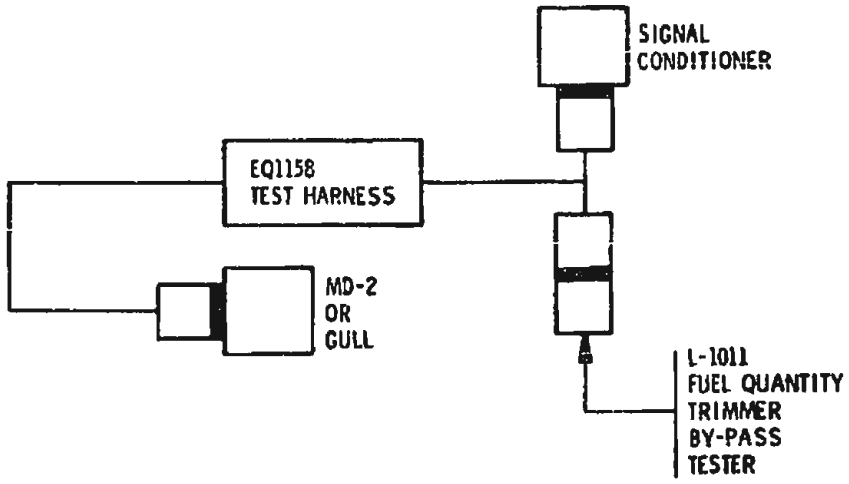


FIGURE 502D

CR Fuel Quantity Transmitter Probe Capacitance
CR Table 501

R	PROBE LOCATION	PROBE NO.	CAPACITANCE (pf)
R	TANK 2L & 2R (OUTBD)	1	16.3 (±0.75)
R	TANK 2L & 2R (OUTBD)	2	25.7 (±0.75)
R	TANK 2L & 2R (OUTBD)	3	25.9 (±0.75)
CR	TANK 2L & 2R (OUTBD)	4	34.8 (±0.75)*
R	TANK 2L & 2R (INBD)	5	44.1 (±0.69)
R	TANK 2L & 2R (INBD)	6	57.4 (±0.83)
R	TANK 2L & 2R (INBD)	7	44.4 (±0.69)
CR	TANK 2L & 2R (INBD)	8	53.2 (±0.73)*
CR	TANK 2L & 2R (INBD)	9	17.8 (±0.69)*
R	TANK 1 & 3	10	62.5 (±0.80)
R	TANK 1 & 3	11	81.3 (±1.08)
R	TANK 1 & 3	12	100.3 (±1.34)
R	TANK 1 & 3	13	81.8 (±1.07)
CR	TANK 1 & 3	14	45.9 (±0.67)*
CR	TANK 1 & 3	15	147.2 (±2.04)*

CR * If probes are out of tolerance high - insure probe is above tank fuel level.

CR 6. Probe Harness Insulation Check

CR NOTE: The following procedures may be used to test individual fuel tank probes for proper insulation resistance values.

CR (1) Connect test harness connectors to MD-2 or Gull tester; to wing harness disconnect plug 2988-P1 (left wing) or 2988-P2 (right wing); and to variable capacitor trimmer connector (Ref. Fig. 502).

CR (2) Measure insulation resistance of each probe (Ref. Table 501) from HI-Z to shield, HI-Z to LOW-Z, LOW-Z to

CR ground, and shield to ground per Table 502. Verify
CR resistance values are greater than shown in Table 502.

CR NOTE: If results are not as noted in Table 502, replace
CR defective probe or make repairs to restore probe and
CR harness resistance to Table 502 values.

CR Probe and Harness Insulation Resistance
CR Table 502

INSULATION RESISTANCE CHECK	MEGOHMETER READING (MEGOHMS)	MD-2 SW POSITION	GULL SW POSITION
HI-Z to Shield	Greater than 2	NR. 5	A - GND
HI-Z to LOW-Z	Greater than 2	NR. 6	A - B
LOW-Z to Ground	Greater than 1	NR. 9	B - GND
Shield to Ground	Greater than 1	NR. 11	Shield to GND

CR (3) Remove test equipment and reconnect aircraft wiring
CR harness to appropriate connectors.

CR (4) Check system operation (Ref. Para. 4A).

CR 7. Tank Probe and Harness Capacitance Measurement

NOTE: Fuel quantity indicator and signal conditioners are bench calibrated to produce empty tank fuel gage readouts based on predetermined, empty tank, probe capacitance values. Probe and harness capacitances are, therefore, measured with the tank empty to assure that no probe is immersed in fuel and to provide a standard test reference capacitance common to all identical aircraft. Untrimmed
CR and trimmed probe and harness capacitances are included
CR in Tables 503 and 504.

A. Untrimmed Probe and Harness Capacitance Measurement

Do not attempt to compensate for an out-of-tolerance untrimmed probe and harness by adjusting a VCTU trimmer capacitor. If not within limits, a check of each probe capacitance (Ref. Para. 7), will be necessary to isolate a
CR faulty probe or wiring harness connection (Ref. Para. 5 and
CR 6).

CR (1) If not empty, defuel tank (Ref. 28-22-00).

(2) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag FUEL QTY IND TEST, 1, 2L, 2R, and 3 circuit breakers (T1 through T5).

C (3) In the MESC, perform preliminary adjustments to MD-2 or
C Gull Test set in accordance with test set operating
C instructions.

C (4) Connect applicable test harness per Figure 502.

C (5) Verify tank probe capacitances agree with Table 503.
C If not within limits shown, check capacitance of each
C probe (Ref. Para. 7) to locate faulty probe.

C NOTE: If most inboard probes (probe 14 and 15 in tanks
C 1 and 3; 8 and 9 in 2L and 2R inboard tanks; 4
C in 2L and 2R outboard tanks) is out of limits,
C these probes, if not faulty, may be still
C immersed in fuel. If draining of tank sump area
C does not bring probe and harness capacitance
C within limits, check individual probe
C capacitance (Ref. Para. 7) to isolate the faulty
C probe. If fault is not in harness connections
C at probe, replace probe and repeat capacitance
C check.

C Untrimmed Probe Loop Capacitance
C Table 503

TANK	CAPACITANCE
	PROBES
2L OUTBD	106.9 (±4.0) pf
2L INBD	221.4 (±5.0) pf
1	525.7 (±8.2) pf
2R OUTBD	106.9 (±4.0) pf
2R INBD	221.4 (±5.0) pf
3	525.7 (±8.2) pf

C (6) Repeat Steps (3) thru (5) for tanks 2L, 2R, and 3.

C (7) Remove test equipment and reconnect aircraft wiring
C harness to applicable connectors.

C (8) Check system operation (Ref. Para. 4A).

B. Trimmed Probe and Harness Capacitance Measurement

NOTE: Probe and harness trimmed capacitance measurements are done with respective signal conditioner wiring harnesses connected to a breakout box connectors and provisions for selecting the trimmed probe and harness to be measured. These measurements must be done by alternately connecting only one signal conditioner at a time to the breakout box. The remaining three signal conditioner harnesses must be connected to their respective units.

(1) If not empty, defuel tank (Ref. Fig. 28-22-00).

NOTE: Be sure no probe is still immersed in fuel. Refer to NOTE in Step 5A(7).

(2) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag FUEL QTY IND - TEST, 1, 2L, 2R, and 3 (T1 through T5).

(3) Connect applicable test harness per Figure 502 instructions.

(4) Set selector switch on tester to NR. 1 tank. Measure probe and harness capacitance. Verify that capacitance is within limits noted in Table 504.

Trimmed Probe and Harness Capacitance
Table 504

TANK	CAPACITANCE
2L OUTBD	112 (±3.0) pf
2R OUTBD	112 (±3.0) pf
2L INBD	226 (±3.6) pf
2R INBD	226 (±3.6) pf
1	530 (±7.0) pf
3	530 (±7.0) pf

(5) Disconnect and remove test equipment and reconnect aircraft wiring harness to appropriate connectors.

(6) Repeat steps (3) thru (5) for tanks 2L, 2R and 3.

CR (7) Close circuit breakers opened in step 5.B.(1) and check
CR system operation (Ref. Para. 4A).

CR 8. Empty Tank Calibration (VCTU Trimmer Adjustment)

C NOTE: Each tank probe and harness is designed to reflect an
C empty tank capacitance within a closely regulated
C tolerance band. Signal conditioners and fuel quantity
C indicators in turn are calibrated to interface with probe
C and harness input capacitance to produce a zero fuel
C quantity gage indication when tanks are empty. Empty
C tank calibration procedures are merely minor adjustments
C of probe and harness capacitance to compensate for
C component tolerance build-up and system installation
C effects that would induce a fuel gage error.

Two methods of calibration are used:

(1) A preferred method which adjusts a trimmer capacitor in the variable capacitance trimmer unit (VCTU) to produce a zero gage indication (Ref. Step A).

C (2) An alternate method which adjusts tank probe and
C harness to the standard capacitance that should zero
C the fuel gage by adjusting the VCTU trimmer and
C observing probe and harness capacitance on a fuel
C quantity system capacitance test set.

C It is most important that no probe be immersed in fuel.
C To ensure that no probe in an emptied tank is immersed
CR in fuel, check the probe capacitances of probes 14 and
CR 15 (tank 1 and 3), & and 9 (tanks 2L and 2R inboard), 4
CR (tanks 2L and 2R inboard) as noted in Paragraph 5.

A. Empty Tank Calibration (Preferred Method)

(1) Verify that empty tank untrimmed probe and harness
CR capacitance is within limits specified on Table 503
CR (Ref. Para. 7A).

(2) At Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, verify that FUEL QTY IND TEST, 1, 2L, 2R and 3 circuit breakers (T1 through T5) and FWD AC GND SVCE BUS (Z11) are closed.

(3) Apply external electrical power (Ref. 24-00-00).

(4) In the MESC, zone 137:

(a) Establish interphone communication with assistant at flight station FUEL SYSTEM panel.

(b) Remove VCTU cover plate to expose capacitor trim adjustment screws.

CAUTION: USE NON-METALLIC SCREWDRIVER WHEN ADJUSTING VCTU TRIM CAPACITORS. DO NOT LOOSEN THE ADJUSTMENT SCREW RETAINING NUT AS THIS WILL CAUSE THE TRIM CAPACITOR TO ROTATE WITHIN THE UNIT.

(5) With FUEL SYSTEM panel 2L INBD and 2R INBD switches depressed, adjust applicable 2L INBD and 2R INBD VCTU trimmers to obtain a corresponding tank quantity indicator reading of 0 ±25 lbs (0 ±11.3 Kg).

(6) Using signal conditioner SYSTEM TEST or FE/SO panel QUANTITY TEST switch, run appropriate tank indicator partially upscale. Release switch and verify that the indicator returns to calibrated setting. Retrim if necessary.

C (7) Depress (release) 2L INBD and 2R INBD switch lights
C (QTY light OUT). Adjust tank 1, 2L, 2R and 3 VCTU
C trimmers to obtain a corresponding tank quantity
C indicator reading of 0 ±25 lbs (0 ±11.3 Kg).

(8) Repeat Step (6).

CR (9) Check trimmed probe and harness capacitance (Ref. Para.
CR 7B).

NOTE: If trimmed probe and harness capacitance is out
CR Table 504 tolerances, check untrimmed probe and
CR harness capacitance (Ref. Para. 7A). If
CR untrimmed capacitance is within Table 503 tolerance, replace FE/SO fuel quantity indicator if it does not agree with fueling panel indicator and recalibrate. If indicators agree, replace applicable signal conditioner and recalibrate

C (10) Reinstall VCTU trimmer screw cover plate.

C (11) Verify connectors P1, P2, P3, and P4 are connected to
C signal conditioners.

C (12) Check system operation (Ref. Para. 4A).

FUEL QUANTITY INDICATING SYSTEM - ADJUSTMENT AND TEST

1. General

A QUANTITY TEST switch on the Flight Engineer/Second Officers FUEL SYSTEM panel, a GAUGES TEST switch on the right wing fueling/defueling panel, and SYS TEST switches on tank 1/1A and 3/3A signal conditioners in the MESC, provide a means of operationally checking the fuel quantity system. All four switches are electrically in parallel and will produce identical system response. When either switch is closed, a simulated full tank signal is internally applied to each signal conditioner fuel quantity measurement channel. Test results are indicated by all fuel quantity indicators, including the totalizer, driving upscale to full tank indications. Since fuel system panel totalizer indicator readout is a summation of separate full tank input signals applied to each flight station indicator, a totalizer, or indicator, that does not drive upscale is faulty. A fault in fuel quantity indicator input signal circuitry (signal conditioner, interconnect wiring) is indicated if any one indicator and totalizer do not drive upscale.

System operational checkout procedures (Ref. Para. 4A) include testing the indicators using both FUEL SYSTEM panel QUANTITY TEST switch, fueling/defueling panel GAUGES TEST switch, and SYS TEST switches located on the 1/1A and 3/3A signal conditioners.

Built-in-Test (BITE) provisions (Ref. Fig. 501) include pushbutton BITE switches on each signal conditioner, push-to-test JTSN, SCAV, and LL (low level) test light switches on the tank 1/1A and 3/3A signal conditioners, and push-to-test JETTISON and SUMP light switches on the tank 2L and 2R signal conditioners.

The above Push-To-Test switches when used in conjunction with the BITE switches and tank 1/1A and 3/3A signal conditioner SYS TEST switches provide a means of separately checking those portions of the fuel level sensing thermistor circuitry located within and external to the signal conditioners. Analysis of the light indications will isolate a fault to a signal conditioner or respective tank thermistor circuit (Ref. 28-41-00, Fault Isolation).

In general, pressing a SYS TEST switch checks all signal conditioner push-to-test switches for faulty lamps and drives all fuel quantity indicators upscale, thus checking the system between signal conditioners and indicators.

Pressing a SYS TEST switch and a signal conditioner push-to-test JTSN, JETTISON SUMP, SCAV or LL (Low Level) light switch at the same time tests the associated fuel level sensing thermistor tank circuit. If a light goes out, the thermistor tank circuit is either shorted or open. Pressing a BITE switch and one of the above light switches at the same time checks that particular thermistor signal processing circuit in the associated signal conditioner. If a light does not come on, a fault exists in the signal conditioner.

Pressing the signal conditioner BITE and SUMP or BITE and LL switches simulates a dry (uncovered) low fuel level sensing thermistor and checks the applicable tank low fuel signal processing circuit in the associated signal conditioner. Pressing a 1/A or 3/3A BITE and SCAV switch in a similar manner checks the associated center section tank fuel transfer control circuits. Pressing a BITE and JTSN (or JETTISON) switch simulates a wet (covered) JETTISON STOP thermistor and checks the signal conditioner JETTISON thermistor circuitry. Each of the preceeding BITE checks should cause the associated green level sensor light to come on.

NOTE: There is normally a 3.0 ± 2.0 second delay before a JTSN (or JETTISON) light will come on. If tanks 1 or 3 are full, there will be a 1 to 2 minute delay before the corresponding tank SCAV light comes on.

Similarly, the JETTISON light should come on (in 3.0 ± 2.0 seconds) when there is enough fuel in the tank to cover the jettison stop thermistor and only the JETTISON push-to-test switch is depressed.

If there is not enough fuel in the tank to cover a low fuel level sensing or fuel transfer termistor, SUMP and SCAV lights should come on when only the associated push-to-test SUMP or SCAV switch is depressed.

If SYS TEST checks confirm that the indicator and signal conditioner circuits are functioning properly, then a fault in fuel quantity indication must be in one or more tank probe or the probe wiring harness. Total probe and harness capacitance measurements with the tank emptied will verify a probe or probe wiring malfunction. The location of this fault can be further isolated to an individual probe and harness by measuring the capacitance of each probe. This measurement requires use of a breakout box that can selectively connect each probe LO-Z wire to a capacitance test set. Test set hook-up is facilitated by two wiring harness breakout connectors located next to the tank 2L signal conditioner (Ref. Fig. 501). All probe LO-Z wiring is routed through one of these connectors to the variable capacitance trimmer unit. Wiring from tank 2R, 3, and 3A probes

is wired through the upper 2899-J2 connector; tank 2L, 1, and 1A probes are wired through the lower 2899-J1 connector.

Signal conditioners and fuel quantity indicators are bench adjusted to provide zero fuel (empty tank) indications for a predetermined dry fuel probe and harness input signal capacitance. Calibration on the aircraft is then limited to adjustment of a probe and harness trimming capacitance in a variable capacitor trimmer unit (VCTU) to compensate for component tolerance build-up and installation effects that would affect fuel gage indication of actual fuel quantity in the tank.

Calibration of the fuel quantity indicating system is accomplished by adjusting eight variable capacitors located in the variable capacitor trimmer unit (VCTU). The procedure (done with tanks empty) sets each FE/SO fuel gage to an empty tank indication by adjusting (or trimming) the total tank probe capacitance applied to the associated fuel quantity signal conditioner. An alternate method, adjusts total tank probe capacitance to the predetermined nominal value that should produce an empty fuel gage indication.

A health monitor check is included to determine if any adverse condition in the fuel tanks, such as micro-biological contamination, moisture, or fuel additives, is degrading transmitter probe performance.

2. Equipment and Materials

Volt-ohmmeter, Simpson Model 260, or equivalent

C MDI Test Set, R & R 90068

C MD2 Test Set, R & R 90069

C Gull, R & R 90225, Test Set - Fuel Quantity System, P/N
C 361-016-001

CR 28-41-22-0022 Fuel Quantity Test Harness (or equivalent)

CR Fuel Quantity Test Harness, 28-41-18-0012, Stk. Nbr. 248-2777
CR Test Harness (or equivalent)

CR NOTE: When equivalent equipment is used, it must perform
CR maintenance manual task. If additional instructions are
CR required, they must be provided locally:

3. Referenced Procedures

	12-11-03	Fuel Level Sight Gages - Servicing
	12-11-11	Underwing Pressure Fueling - Servicing
R	24-00-00	Electrical Power - Maintenance Practices
	28-22-00	Defueling - Maintenance Practices
	28-41-00	Fuel Quantity Indicating System - Fault Isolation
	28-41-01	Wing Tank Fuel Quantity Probe - Removal and Installation

4. Adjustment/Test

A. Operational Test

(1) On the galley right circuit breaker panel, zone 130, verify that the following circuit breakers are closed:

FUEL SYS GA RPTR IND (A15)

DEFUELING CONTROL PWR (H16)

FUELING VALVE TEST (H17)

FUELING VALVES (H18)

REFUEL PWR CONT (H19)

REFUEL ALTN POWER (G20)

On the galley left circuit breaker panel, zone 130, verify that circuit breaker DC BUS - PWR REFUELING (B21) is closed.

On the FE/SO aft circuit breaker panel CB3, zone 215, verify that the following circuit breakers are closed:

FWD AC GND SVCE BUS (Z11)

FUEL QTY IND - TEST, 1, 2L, 2R, and 3 (T1 through T5)

(2) Apply external electrical power (Ref. 24-00-00).

(3) On Flight Engineer/Second Officers FUEL SYSTEM panel, zone 215:

(a) Verify that REFUEL POWER ON light is not on. If on, momentarily depress switchlight to relax solenoid held SYSTEM POWER switch on right wing fueling/defueling panel. ON light must go out.

(b) Perform panel lights test to verify operational status of indicating light lamps (Ref. 33-17-00).

On aircraft 025-026, 028-031 without SB28-039 (Rev. 5), depress (latch) TANK 1A XFR and TANK 3A XFR switchlights to enable Tank 1A/3A LOW light circuit.

NOTE: Tank 1A and/or tank 3A low lights may be already on if fuel in respective tank 1A or 3A is less than 175 lbs (70 Kg).

Depending on aircraft attitude, 2L INBD or 2R INBD LOW light may be already on if respective tank contains less than 700 lbs (318 Kg) of fuel.

(4) Record tank 1, 2L, 2R, and 3 fuel quantities. Verify that totalizer counter agrees with total fuel displayed by indicators.

NOTE: If tanks are empty, fuel quantity indicators shall read 0 ± 100 lb (0 ± 45 Kg).

(5) Hold QUANTITY TEST switch depressed. Verify that all four quantity indicators, and totalizer counter, drive upscale to the following indications.

TANK	INDICATION
C 1	64,000 ± 600 LBS (29,000 ± 275 KG)
2L	27,000 ± 300 LBS (12,250 ± 125 KG)
2R	27,000 ± 300 LBS (12,250 ± 125 KG)
3	64,000 ± 600 LBS (29,000 ± 275 KG)
TOTALIZER	182,000 ± 1000 LBS (83,000 ± 500 KG)

(6) Release QUANTITY TEST switch. Verify that all indicators drive downscale to previous reading.

(7) Depress (latch) 2L INBD, TANK 1A, TANK 3A, and 2R INBD switchlights. Verify that the QTY light in each

switchlight comes on and that the fuel quantity indicator pointers move to a reading displaying the amount of fuel in tank 1A, 3A and inboard sections of
C tank 2L and 2R (Reading will decrease if 2L or 2R
C outboard or if 1 or 3 has fuel in tank).

NOTE: The QUANTITY light only indicates switch position.

(8) Depress (release) the switchlights. Verify that QUANTITY lights go out and fuel quantity indicators return to previous reading.

(9) At the right wing fueling/defueling panel, zone 621, place SYSTEM POWER switch to ON position. Verify that REFUEL POWER light on flight station FUEL SYSTEM panel comes ON.

(10) Hold LIGHTS TEST switch actuated. Verify all panel lights (if not already on) come on.

(11) Record tank 2L, 2R, 1, and 3 fuel quantity indications. Verify that these readings agree with corresponding indicators on flight station FUEL SYSTEM panel.

C NOTE: Cockpit and wing indicator shall agree ±100 lbs.

(12) Observe six SET POINT TEST lights and fuel cutout index (bug) positions. Tank 2L, 1, 3, and 2R SET POINT TEST lights must be on if bug is set higher than indicator pointer. Tank 1A and 3A SET POINT TEST lights must be
R on if bug is set higher than indicator pointer and
R higher than 53,800 lbs (24, 400 Kg).

R (13) Set fuel cutoff bugs on 2L, 1, 3, and 2R indicators at
R approximately midscale (or higher than pointer).

R (14) Hold GAUGES TEST switch actuated. Verify that each
R fuel quantity indicator drives upscale to positions
R noted in Step 4A(5). Verify SET POINT TEST lights go
R out when GAUGES TEST switch is pressed.

(15) Release test switch. Verify that all indicators drive downscale to previous reading.

(16) Depress REFUEL POWER switch. Verify that ON light goes out. At right wing fueling/defueling panel, verify that SYSTEM POWER switch has released to the OFF position and that fuel quantity indicators display the amount of fuel in the respective 2L, 1, 3, and 2R
C tanks.

B. SYSTEM Test and BITE Check

NOTE: Significance of signal conditioner JTSN/JETTISON, SUMP, LL, and SCAV lights during these tests is affected by whether fuel level sensing thermistors are uncovered or submerged in fuel. Therefore, before doing system test and BITE check, determine amount of fuel in tanks 1 and 1A, 3 and 3A and 2L/2R (inbd section).

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, verify that the FUEL QTY IND TEST - 1, 2L, 2R, and 3 circuit breakers (T1 through T5) are closed.

(2) At flight station FUEL SYSTEM panel, verify that the FUEL JETTISON panel MASTER switch is unlatched (OPEN light out), and all four DUMP switches are unlatched (DUMP lights out).

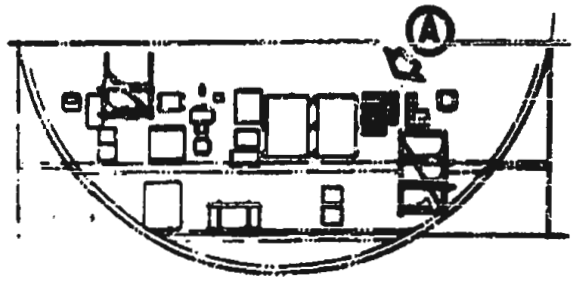
(3) In the MESC, zone 137, alternately depress SYS TEST switch on tank 1/1A and 3/3A signal conditioners (Ref. Fig. 501). Verify that the green push-to-test lights on each signal conditioner come on.

NOTE: This check verifies that the green push-to-test switch lamps are operational. The test will also drive all fuel quantity indicators upscale as noted in Steps 4A(5) and 4A(14) thus verifying the fuel quantity measurement circuitry between the signal conditioners and fuel quantity indicators.

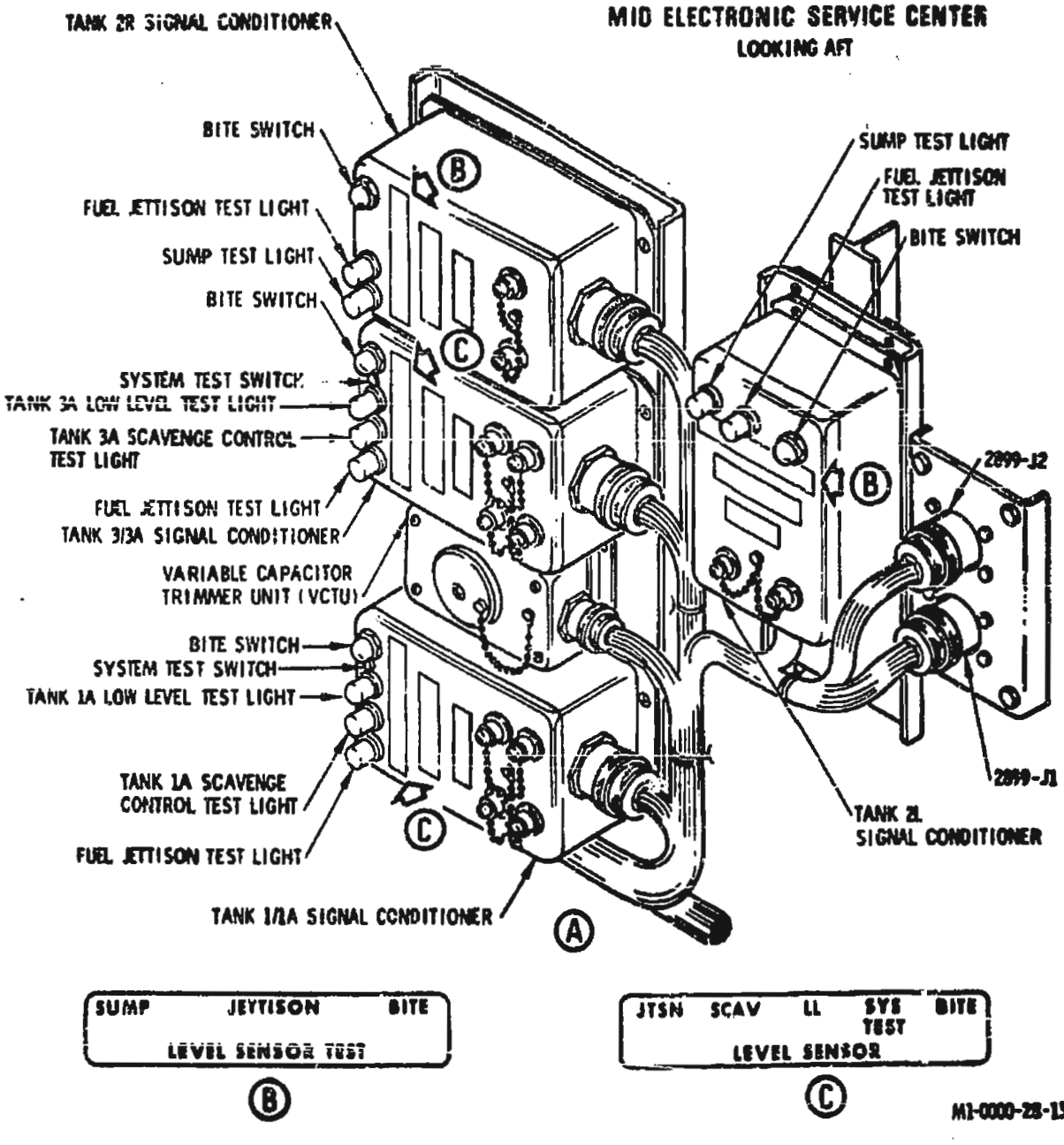
(4) While holding either 1/1A or 3/3A signal conditioner SYS TEST switch pressed in, alternately depress the SUMP, SCAV, LL, JTSN and JETTISON push-to-test light switches on the appropriate signal conditioners. Verify that each green light comes on.

NOTE: There is a 3.0 (±2.0) second delay before a JTSN
R or JETTISON light will come on. If tank 1 or 3
R is full, there will be a one to two minute delay before a SCAV light will come on.

If any of the above lights do not come on, an open or short in the applicable fuel level thermistor circuitry is indicated, either internally within the signal conditioner or externally in the thermistor or thermistor wiring. If the signal conditioner is faulty, it can be verified by performing the appropriate BITE check (Ref. Step 6 through 9).



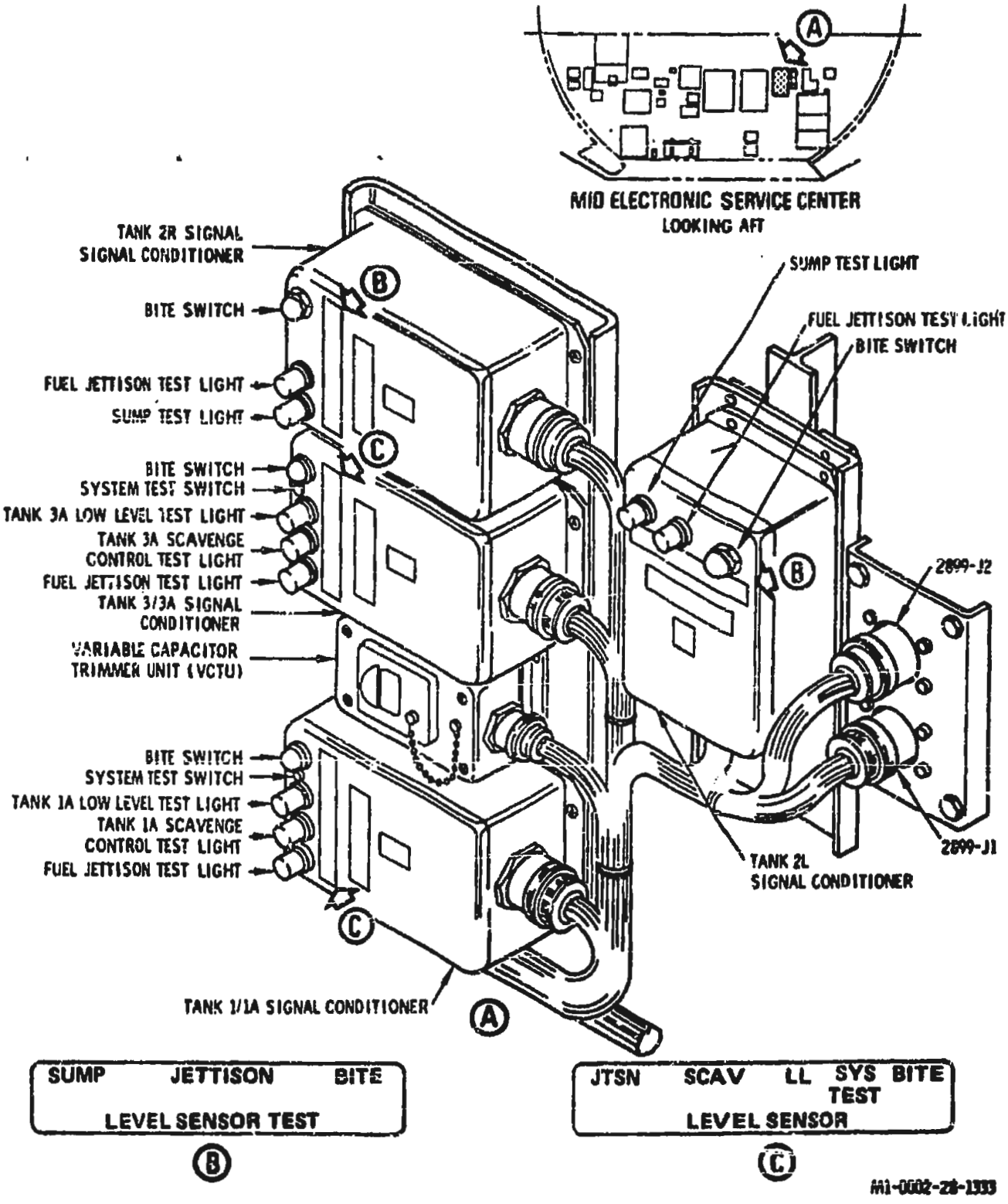
MID ELECTRONIC SERVICE CENTER
LOOKING AFT



Fuel Quantity System Signal Conditioners
Figure 501

R EFFECTIVITY: 025-026, 028-031
R

006B



Fuel Quantity System Signal Conditioners
Figure 501

R EFFECTIVITY: 032-999
R

006B

(5) Release SYS TEST switch.

(6) On each of the 2L and 2R signal conditioners, simultaneously depress the BITE test and SUMP push-to-test light switches. The SUMP light must come on if the respective tank low fuel level sensing thermistor is submerged in fuel. Depending on aircraft attitude, SUMP (low fuel level sensing) thermistor will be submerged when 2L/2R inboard tank fuel quantity is more than 700 lbs/318 Kg.

NOTE: If the thermistor is not submerged, the SUMP light must come on when only the SUMP light switch is depressed.

The above test checks the internal signal conditioner low fuel level signal processing circuits by simulating a dry (uncovered) SUMP thermistor. If the test results are not as noted, a fault in the signal conditioner is indicated.

(7) On each of the 1/1A and 3/3A signal conditioners, simultaneously depress the BITE test and SCAV push-to-test light switches. If the 1A/3A fuel transfer/scavenge control thermistor is immersed in fuel, the SCAV light must come on.

NOTE: If tank 1 or 3 full tank fuel level sensing thermistor is not submerged, the respective SCAV light must come on when only the SCAV light switch is depressed.

If the SCAV thermistor is submerged, there will be a 1 to 2 minute time delay before the SCAV light comes on.

Depressing the BITE switch inserts a simulated dry (uncovered) thermistor input signal in the signal conditioner fuel transfer/scavenge control circuitry. If the test result is not as noted, a fault in the signal conditioner is indicated.

(8) On each of the 1/1A and 3/3A signal conditioners, simultaneously depress the BITE test and LL (Low Level) push-to-test light switches. Verify that the LL light comes on.

NOTE: If tank 1A or 3A low fuel level sensing thermistor is not submerged in fuel, the respective LL light for that tank must come on

when only the light switch is depressed. (Tank 1A/3A low level sensing thermistor is uncovered when fuel level is lower than 175 lbs/70 Kg).

Depressing the BITE switch inserts a simulated dry (uncovered) thermistor input signal to the signal conditioner low fuel level sensing circuitry. If the test result is not as noted, a fault in the signal conditioner is indicated.

(9) On each signal conditioner, simultaneously depress the BITE test and JTSN/JETTISON push-to-test light switches. Verify that the JTSN/JETTISON light comes on.

NOTE: There is a 3 (±2) second time delay before the JTSN/JETTISON light comes on.

Depressing the BITE switch inserts a simulated wet (submerged sensor) jettison level input signal to the signal conditioner jettison control circuitry. If test results are not as noted, a fault in the signal conditioner is indicated.

If tank 1 and 3 fuel is more than 4000 lbs/1814 Kg, and Tank 2L/2R inboard section fuel is more than 800 lbs/363 Kg (sufficient to submerge the jettison stop thermistor) JTSN/JETTISON lights will come on when only the push-to-test switch is depressed.

C. Health Monitor Check

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, verify that FUEL QTY IND circuit breakers T1 through T5 are closed.

(2) Apply external electrical power (Ref. 24-00-00).

(3) In the MESC, zone 137, measure the dc voltage at terminal board 2841-TB4 (terminal strips noted below). Verify that the measured voltage is less than 4.0V dc.

Tank 2L	Terminal Strip 13
Tank 1	Terminal Strip 11
Tank 3	Terminal Strip 12
Tank 2R	Terminal Strip 14

(4) Turn off external electrical power (Ref. 24-00-00).

C 5. Individual Fuel Tank Harness and Probe Capacitance Check

NOTE: Fuel quantity indicator and signal conditioners are bench calibrated to produce empty tank fuel gage readouts based on predetermined, empty tank, probe and wiring harness
C capacitance values. Probe and harness capacitances are, therefore, measured with the tank empty to assure that no probe is immersed in fuel and to provide a standard test reference capacitance common to all identical aircraft.

C If INDIVIDUAL Probe and harness capacitance and Resistance are
C not as specified in Tables 501 and 502, a faulty probe may be
C located by checking the capacitance of each individual probe in
C the effected probe and harness. Probe capacitances in Table 501
C are empty tank values. Probe and harness Resistance Values are
C specified in Table 502.

A. Individual Tank Probe Capacitance

C (1) On the Flight Engineer/Second Officers aft circuit
C breaker panel CB3, zone 215, open and tag FUEL QTY IND
C circuit breakers T1 through T5.

C (2) In the MESC, disconnect 2841-P10 harness plug at VCTU
C and connect to fuel quantity probe test set.

C NOTE: Refer to Figure 502 for test harness hookup.

C (3) If measuring tank 2R, 3, or 3A probes, disconnect
C harness plug 2899-P2 at 2899-J2 connector located next
C to the 2L signal conditioner and connect 24 pin harness
C plug from test set. If measuring 2L, 1, or 1A probes,
C disconnect 2899-P1 connector and connect harness plug
C from test set.

C (4) Connect test set to MD-2 or Gull capacitance tester.
C Perform preliminary adjustments to capacitance test set
C in accordance with test set instructions.

C (5) Select tank and probes to be checked and record probe
C capacitance. Verify probe capacitance is as noted in
C Table 501.

C (6) Remove test equipment and reconnect aircraft wiring
C harness to appropriate connectors.

C (7) Check system operation (Ref. Para. 4A).

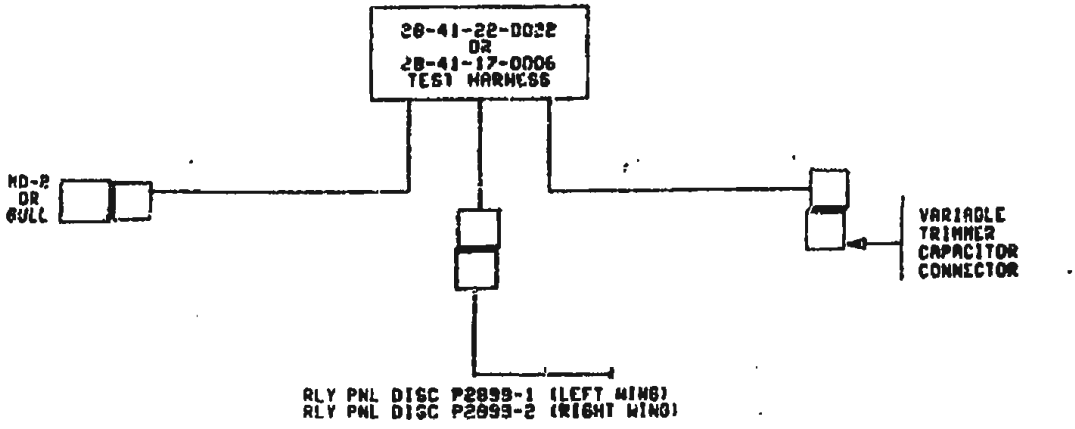


FIGURE 502A

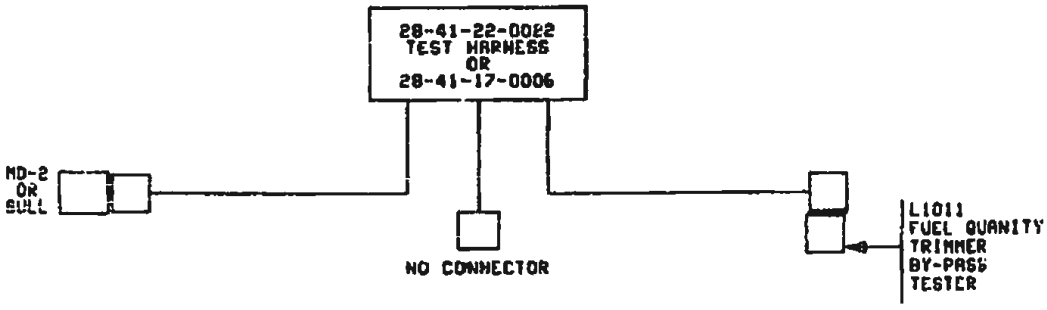


FIGURE 502B

MI-0000-00-1630

CR
CR

Test Harness Installation
Figure 502

Fuel Quantity Transmitter Probe Capacitance
Table 501

PROBE LOCATION	PROBE NO.	CAPACITANCE (pf) PROBE
TANK 2L & 2R (OUTBD)	1	16.3 (±0.75)
TANK 2L & 2R (OUTBD)	2	25.7 (±0.75)
TANK 2L & 2R (OUTBD)	3	25.9 (±0.75)
TANK 2L & 2R (OUTBD)	4	34.8 (±0.75)*
TANK 2L & 2R (INBD)	5	44.1 (±0.69)
TANK 2L & 2R (INBD)	6	57.4 (±0.83)
TANK 2L & 2R (INBD)	7	44.4 (±0.69)
TANK 2L & 2R (INBD)	8	53.2 (±0.73)*
TANK 2L & 2R (INBD)	9	17.8 (±0.69)*
TANK 1 & 3	10	62.5 (±0.80)
TANK 1 & 3	11	81.3 (±1.08)
TANK 1 & 3	12	100.3 (±1.34)
TANK 1 & 3	13	81.8 (±1.07)
TANK 1 & 3	14	45.9 (±0.67)*
TANK 1 & 3	15	147.2 (±2.04)*
TANK 1A & 3A	16	44.5 (±0.75)
TANK 1A & 3A	17	48.2 (±0.75)

* If probe is out of tolerance, high-verify probe is above fuel level.

B. Probe Harness Insulation Check

NOTE: The following procedures may be used to test individual fuel tank probes for proper insulation resistance values.

CR (1) Connect test harness connectors to MD-2 or Gull testers to wing harness disconnect plug 2988-P1 (left wing) or 2988-P2 (right wing); and to variable capacitor trimmer connector (Ref. Fig. 502).

CR (2) Measure insulation resistance of each probe (Ref. Table 502) from HI-Z to shield, HI-Z to low-Z, Low-Z to ground, and shield to ground per Table 502. Verify resistance values are greater than shown in Table 502.

CR NOTE: If results are not as noted in Table 502 replace defective probe or make repairs to restore probe and harness resistance to Table 502 values.

CR Probe and Harness Insulation Resistance
CR Table 502

INSULATION RESISTANCE CHECK	MEGOHMETER READING (MEGOHMS)	MD-2 SW POSITION	GULL SW POSITION
HI-Z to Shield	Greater than 2	NR.5	A-Ground
HI-Z to LOW-Z	Greater than 2	NR.6	A-B
LOW-Z to Ground	Greater than 1	NR.9	B-Ground
Shield to Ground	Greater than 1	NR.11	Shield to Ground

CR (3) Remove test equipment and reconnect aircraft wiring harness to appropriate connectors.

CR (4) Check system operation (Ref. Para. 4A).

CR 6. Probe and Harness Capacitance Measurement

CR NOTE: Fuel quantity indicator and signal conditioners are bench calibrated to produce empty tank fuel gage readouts based on predetermined, empty tank, probe and wiring harness capacitance values. Total probe and harness capacitances are, therefore, measured with the tank empty to assure that no probe is immersed in fuel and to provide a standard test reference capacitance common to all identical aircraft. Untrimmed and trimmed probe and harness capacitances are included in Tables 503 and 504.

CR A. Untrimmed Probe and Harness Capacitance Measurement

CR NOTE: Untrimmed probe and harness capacitance measurements are done with trimmer unit (VCTU) wiring harnesses

CR connected to a breakout box having cable connectors
CR and provisions for selecting the probes to be
CR measured.

CR Do not attempt to compensate for an out-of-tolerance
CR untrimmed probe and harness by adjusting a VCTU
CR trimmer capacitor. If not within limits, a check of
CR each probe capacitance (Ref. Para. 5A), will be
CR necessary to isolate a faulty probe or wiring harness
CR connection (Ref. Para. 5B).

CR (1) If not empty, defuel tank (Ref. 28-22-00).

CR (2) On Flight Engineer/Second Officers aft circuit breaker
CR panel CB3, zone 215, open and tag FUEL QTY IND - TEST,
CR 1, 2L, 2R, and 3 circuit breakers (T1 through T5).

CR (3) In the MESC, perform preliminary adjustments to
CR capacitance test set in accordance with test set
CR operating instructions.

CR (4) Verify that electrical harness plugs P1, P2, P3, and P4
CR are connected to respective signal conditioners (Ref.
CR Fig. 501).

CR (5) Connect applicable test harness per Figure 502.

CR (6) Select appropriate tank.

CR (7) Verify untrimmed probe and harness capacitances agree
CR with Table 503. If not within limits shown, check
CR individual probe capacitances (Ref. Para. 7) to locate
CR faulty probe.

NOTE: If most inboard probes (probe 14 and 15 in tanks 1 and 3; 8 and 9 in 2L and 2R inboard tanks; 4 in 2L and 2R outboard tanks) is out of limits, these probes, if not faulty, may be still immersed in fuel. If draining of tank sump area does not bring probe and harness capacitance within limits, check individual probe
CR capacitance (Ref. Para. 7 & 8) to isolate the
CR faulty probe. If fault is not in harness
CR connections at probe, replace probe and repeat
CR capacitance check.

Untrimmed Probe and Harness Capacitance
Table 503

TANK	CAPACITANCE
	PROBES
2L OUTBD	106.9 (±4.4) pf
2L INBD	221.4 (±5.7) pf
1	525.7 (±9.7) pf
2R OUTBD	106.9 (±4.4) pf
2R INBD	221.4 (±5.7) pf
3	525.7 (±9.7) pf
1A	94.5 (±2.2) pf
3A	94.5 (±2.2) pf

(8) Remove test equipment and reconnect aircraft wiring harness to appropriate connectors.

(9) Deleted

(10) Check system operation (Ref. Para. 4A).

B. Trimmed Probe and Harness Capacitance Measurement

NOTE: Probe and harness trimmed capacitance measurements are done with respective signal conditioner wiring harnesses connected to a breakout box having cable connectors and procisions for selecting the probe to be measured. Probe HI-Z and Lo-Z levels acquired from breakout box receptacles are applied to a fuel gaging test set or calibration unit (Ref. Paragraph 2) and displayed as capacitance in picofarads (Ref. Table 504). Capacitance values listed in Table 504 are with tanks empty.

(1) If not empty, defuel tank (Ref. Fig. 28-22-00).

NOTE: Be sure no probe is still immersed in fuel.

(2) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag FUEL QTY IND - TEST, 1, 2L, 2R, and 3 (T1 through T5).

C (3) In MESC, zone 137, set up capacitance test set just
C below signal conditioners.

(4) Make preliminary adjustments to capacitance test set in accordance with test set instructions.

CR (5) Connect applicable test harness per Figure 502.

CR (6) Deleted

CR (7) Select applicable probe and harness. Measure probe and
CR harness capacitance. Verify that capacitance is within
CR limits noted in Table 504.

CR Probe and Harness Trimmed Capacitance
CR Table 504

TANK	BREAKOUT BOX SW POSITION	CAPACITANCE	
		DRY PROBES	WET PROBES
2L OUTBD	2L OB	112 (±2.0) pf	112 (±3.0) pf
2R OUTBD	2R OB	112 (±2.0) pf	112 (±3.0) pf
2L INBD	2L IB	226 (±2.0) pf	226 (±3.6) pf
2R INBD	2R IB	226 (±2.0) pf	226 (±3.6) pf
1	1	530 (±4.5) pf	530 (±7.0) pf
3	3	530 (±4.5) pf	530 (±7.0) pf
1A	1A	102 (±2.0) pf	102 (±2.5) pf
3A	3A	102 (±2.0) pf	102 (±2.5) pf

C (8) Reconnect aircraft wiring harness (P1, P2, P3, or P4)
CR plug to signal conditioner (if removed).

(9) Repeat Steps (5) through (8) for the remaining three signal conditioners (as required).

(10) Disconnect capacitance test set cables and remove test set and breakout box from MESC.

(11) Verify P1, P2, P3, and P4 plugs are securely connected to signal conditioners and lock-wired.

CR (12) Remove tags and close circuit breakers opened in Step CR 6B(2).

CR (13) Check System operation (Ref. Para. 4A).

6. Empty Tank Calibration (VCTU Trimmer Adjustment)

C NOTE: Each probe and harness is designed to reflect an empty C tank capacitance within a closely regulated tolerance C band. Signal conditioners and fuel quantity indicators C in turn are calibrated to interface with probe and C harness input capacitance to produce a zero fuel quantity C gage indication when tanks are empty. Empty tank C calibration procedures are merely minor adjustments of C probe and harness capacitance to compensate for component C tolerance build-up and system installation effects that C would induce a fuel gage error.

Prior to setting up equipment for calibrating a fuel gage, it is recommended that a requirement to calibrate be determined by checking the applicable fuel quantity indicator for zero fuel readout within 0±100 lbs (0±50Kg).

A. Empty Tank Calibration (Preferred Method)

C NOTE: It is most important that no probe be immersed in C fuel. To ensure that no probe in an emptied tank is C immersed in fuel, check probe capacitances (wet C values) of probes 14 and 15 (tank 1 and 3), 8 and 9 C (tanks 2L and 2R inboard), 4 (tanks 2L and 2R CR inboard) as noted in Paragraph 5.

Empty tank untrimmed probe and harness capacitance CR must be within limits specified on Table 503 (Ref. CR Para. 6A).

(1) At Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, verify that FUEL QTY IND - TEST 1, 2L, 2R and 3 circuit breakers (T1 through T5) and FWD AC GND SVCE BUS (Z11) are closed.

(2) Apply external electrical power (Ref. 24-00-00).

(3) In the MESC, zone 137:

(a) Establish interphone communication with assistant at flight station FUEL SYSTEM panel.

(b) Remove VCTU cover plate to expose capacitor trim adjustment screws.

CAUTION: USE NON-METALLIC SCREWDRIVER WHEN ADJUSTING VCTU TRIM CAPACITORS. DO NOT LOOSEN THE ADJUSTMENT SCREW RETAINING NUT AS THIS WILL CAUSE THE TRIM CAPACITOR TO ROTATE WITHIN THE UNIT.

(4) With FUEL SYSTEM panel 2L INBD and 2R INBD switches depressed, adjust applicable 2L INBD and 2R INBD VCTU trimmers to obtain a corresponding tank quantity indicator reading of 0 ±25 lbs (0 ±11.3 Kg).

(5) Using signal conditioner SYSTEM TEST or FE/SO panel QUANTITY TEST switch, run appropriate tank indicator partially upscale. Release switch and verify that the indicator returns to calibrated setting. Retrim if necessary.

(6) Depress (release) 2L INBD and 2R INBD switches. Adjust tank 2L and 2R OUTBD VCTU trimmers to obtain a corresponding tank quantity indicator reading of 0 ±25 lbs (0 ±11.3 Kg).

C (7) Repeat Step (5).

C (8) Check trimmed probe and harness capacitance (Ref. Para. C 5B).

CR NOTE: If probe and harness trimmed capacitance is out CR Table 504 tolerances, check untrimmed probe and CR harness capacitance (Ref. Para. 5A). If CR untrimmed capacitance is within Table 503 CR tolerance, replace FE/SO fuel quantity indicator if it does not agree with fueling panel indicator and recalibrate. If indicators agree, replace applicable signal conditioner and recalibrate.

C (9) Reinstall the VCTU circular adjustment cover.

CR (10) Check system operation (Ref. Para. 4A).

WING TANK FUEL QUANTITY PROBE - REMOVAL AND INSTALLATION

1. General

Fuel quantity transmitter probes are removed and installed from the wing upper surface. The probes are identified by numbers embossed in the visible surface of the probe mounting flange, number one probe being located most outboard in the wing. They are interchangeable only with the corresponding probe installed in the opposite wing. Probe number 9 is equipped with a low fuel level warning thermistor. Probe numbers 3, 9, and 13 are equipped with fuel jettison stop thermisters.

2. Equipment and Materials

Buna N Adhesive, LCP 79-2061 Type I, or equivalent Fed Mil Spec MM-A-1617(1) TYPE III. (May be procured from Stabond Corp.
CR 14010 South Western Ave., Gardena, Ca. 90249) (TWA STK NBR
CR 50-0271 or 50-0283).

Aerodynamic Smoothing Compound C40-769A, Type I or equivalent (Product Research Co. PR 1301 HT-K, or Coast Proseal and Mfg.
C Co. No. 712 are approved equivalents) (TWA STK NBR 50-0421).

Gasket (Ref. Fig. 401)

Wire or Stiff Bristle Brush (appropriate for 10-32 internal threads)

Tie-Strap MS3367-2-9

3. Referenced Procedures

WM20-11-16	L-1011 Fuel Tank Harness Repair, Splicing, and Retermination Data
24-00-00	Electrical Power System - Maintenance Practices
28-11-00	Fuel Tanks - Maintenance Practices
28-22-00	Defueling - Maintenance Practices
28-41-00	Fuel Quantity Indicating System - Adjustment and Test
28-11-15	Fuel Probe Mounting Ring - Removal and Installation

4. Removal/Installation

WARNING: VERIFY THAT THE AIRCRAFT AND EQUIPMENT USED IN FUEL SYSTEM MAINTENANCE/SERVICING OPERATIONS ARE STATICALLY GROUNDED IN ACCORDANCE WITH APPROVED PROCEDURES. OBSERVE ALL SAFETY REGULATIONS (REF. 28-11-00).

A. Removal

(1) Transfer fuel, as necessary, to lower fuel level below maximum listed below for the fuel quantity probe being removed (Ref. 28-22-00).

NOTE: Stick values are for aircraft level in pitch and roll.

PROBE NO.	SIGHT GAGE STICK	MAXIMUM FUEL LEVEL (LBS)
1	1	8250
2	1	7250
3	1	EMPTY
4	1	EMPTY
5	2	FULL
6	2	FULL
7	2	16000
8	2	15750
9	3	6500
10	5	53250
11	5	53250
12	5	52750
13	6	44500
14	6	37000
15	5	50750

(2) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag circuit breakers FUEL QTY IND - 1, 2L, 2R, 3, and TEST (T2 through T5 and T1).

R On galley right circuit breaker panel, zone 130, open and tag circuit breakers FUEL SYSTEM - REFUEL PWR CONT (H19) and REFUEL ALTN PWR (G20).

On galley left circuit breaker panel, zone 130, open and tag circuit breaker DC BUS PWR REFUELING (B21).

(3) Remove aerodynamic smoothing compound from gap around flange of probe. (Be certain all residue is removed to avoid entry into tank when probe is removed.)

(4) Remove flange attach screws (Ref. Fig. 401).

(5) Carefully lift probe out of wing until electrical wiring connections are accessible.

WARNING: DO NOT ALLOW CUT STRAPS TO FALL INTO TANK.

(6) Carefully cut straps that hold harness wires to probe (Ref. Fig. 402).

(7) Disconnect electrical wiring by removing screws from terminals. Loosen wiring strain relief clamp screws to separate wiring from probe.

(8) Remove probe.

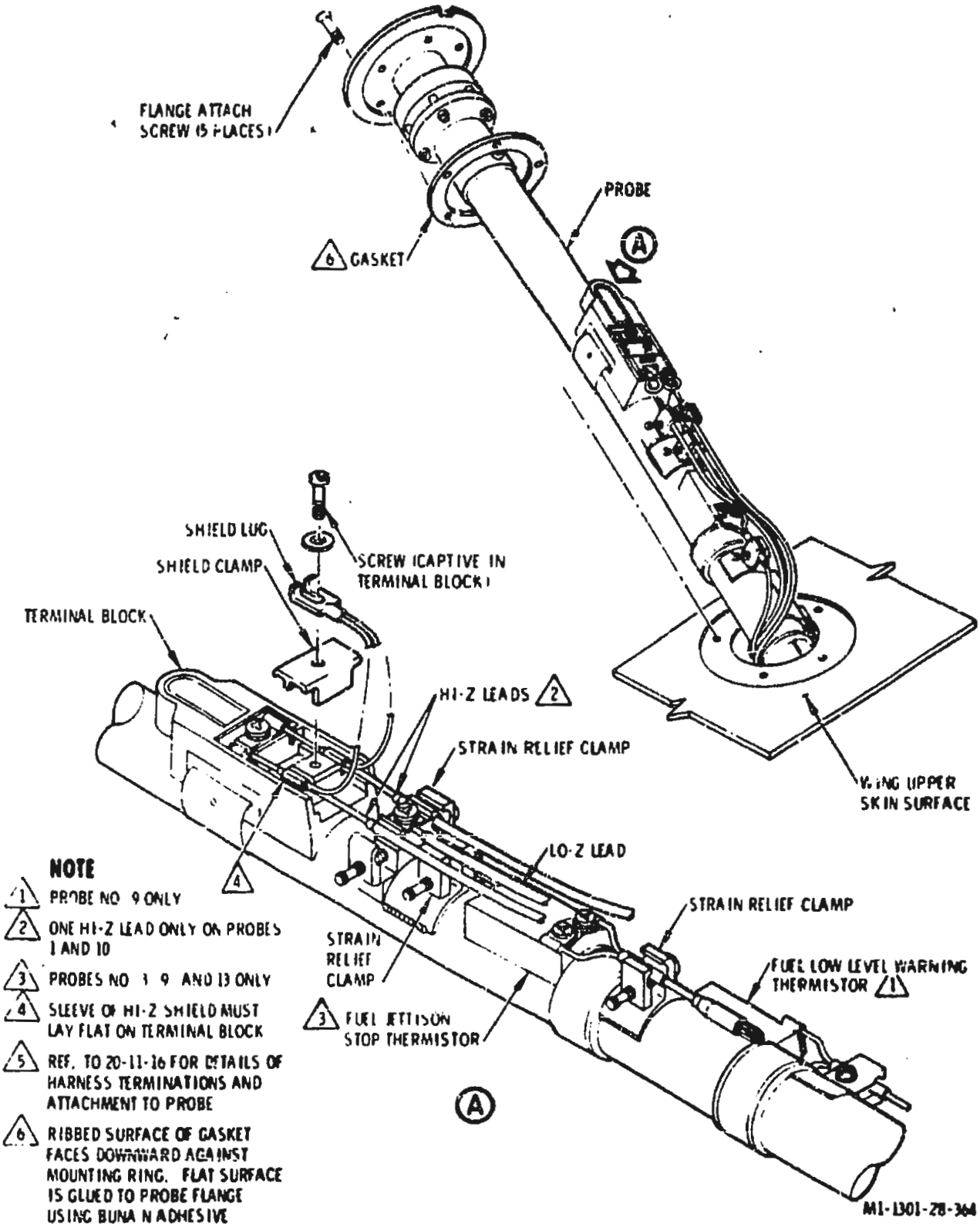
B. Installation

(1) Verify that circuit breakers opened in Step 4A(2) are open and tagged.

NOTE: Inspect probe attach screw threaded inserts located in the mounting ring. If clogged with sealant, clean insert threads using a wire or stiff bristle brush. Vacuum out dislodged sealant and check insert using clean probe attach screw. If threaded insert cannot be rendered serviceable insert (or mounting ring) will have to be replaced (Ref. 28-11-15).

(2) Install new flange gasket as follows:

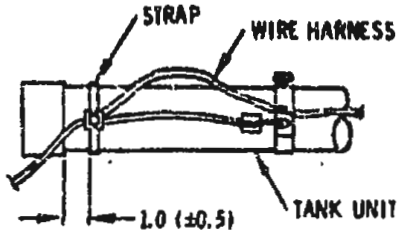
(a) Apply a thin film of BUNA N adhesive to probe flange.



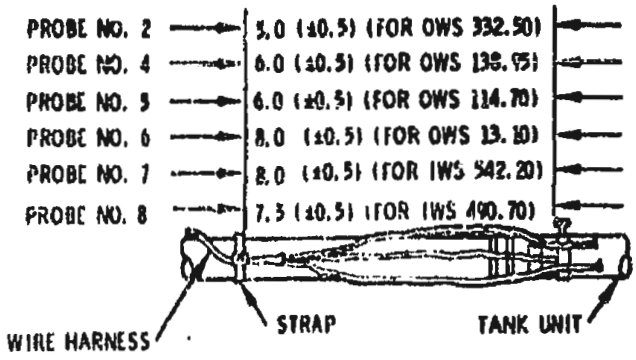
NOTE

1. PROBE NO. 9 ONLY
2. ONE HI-Z LEAD ONLY ON PROBES 1 AND 10
3. PROBES NO. 1, 9, AND 13 ONLY
4. SLEEVE OF HI-Z SHIELD MUST LAY FLAT ON TERMINAL BLOCK
5. REF. TO 20-11-16 FOR DETAILS OF HARNESS TERMINATIONS AND ATTACHMENT TO PROBE
6. RIBBED SURFACE OF GASKET FACES DOWNWARD AGAINST MOUNTING RING. FLAT SURFACE IS GLUED TO PROBE FLANGE USING BUNA N ADHESIVE

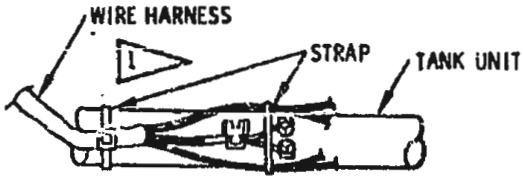
R Fuel Quantity Tank Probe - Removal and Installation
R Figure 401



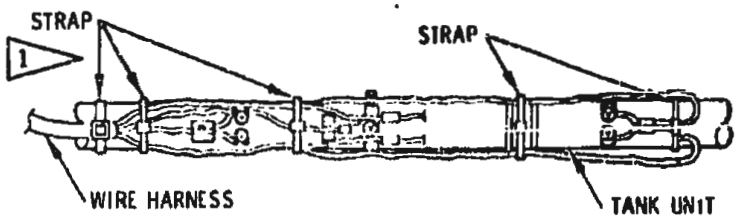
PROBE NO.1



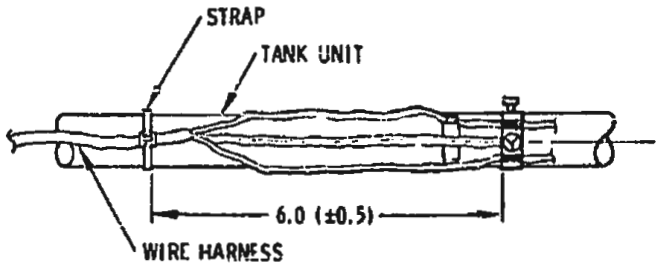
PROBES NO. 2, 4, 5, 6, 7, 8



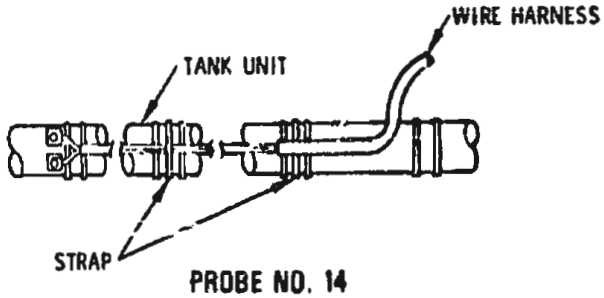
PROBE NO. 3



PROBE NO. 9



PROBES NO. 10, 11, 12, 13, 15



PROBE NO. 14

NOTE

1 WITH SB28-045

M1-0002-20-669

R Probe Harness Ties
R Figure 402

EFFECTIVITY: ALL

0018

NOTE: Gasket must be installed with flat surface against probe flange (ribbed surface exposed).

(b) Install gasket.

(3) Connect wiring to probe using captive screws on wiring terminals. Clamp wiring to probe.

R R (4) Tie harness to probe using wire bundle tie-straps 5 to 8 inches below the lowest strain relief clamp (Ref. Fig. 402).

(5) Carefully insert probe into wing and align attach screw holes in probe and gasket with holes in mounting ring. Do not use sealant between ribbed surface of gasket and mounting ring. Be certain that lower end of probe is properly centered in ring support located in bottom of the tank. This can be determined by gripping the edges of the probe flange and swinging it gently fore and aft, and side to side. If the probe is properly positioned in the ring, it will only be possible to swing it a very small amount in any direction. When released, probe flange must lay flat in its recess.

(6) Install probe attach screws.

(7) Remove tags and close circuit breakers opened in Step 4A(2).

(8) Turn on electrical power (Ref. 24-00-00).

(9) Check and, if necessary, trim applicable tank total probe and harness capacitance (Ref. 28-41-00 Adjustment and Test).

R R R NOTE: VCTU trimmer capacitor adjustment may be postponed until the fourth probe in any one tank is changed.

(10) Fill tank and check for fuel leak at probe flange.

(11) Turn off electrical power (Ref. 24-00-00).

(12) Fill gap between probe flange and wing skin with C C aerodynamic smoothing compound Mfg PN PR1435 (or equivalent).

FUEL QUANTITY TANK PROBE HARNESS - APPROVED REPAIRS

1. General

R A. This procedure is for the in-situ repair of fuel quantity
R probe harness assemblies.

R Loose shield terminations and/or oxidized terminals result
R in inaccurate and fluctuating fuel quantity indication.
R Cleaning or replacement of terminals at probe terminal block
R will usually correct this type of problem. Probes do not
R deteriorate in service. Probes should be replaced only
R after harness verification.

R WARNING: WHEN HARNESS ASSEMBLY MUST BE REPAIRED ON-BOARD
R AIRCRAFT AND SOLDERING IS REQUIRED TO MAKE REPAIR, USE
R ONLY APPROVED HEAT GUNS AND PROCEDURES.

R 2. Equipment and Materials

R On aircraft without SB28-087,
R Cable, HI Z, C-01-1204-SW, or equivalent

R On aircraft with SB28-087,
R Cable, HI Z, Boeing Specification 10-60875-4, or equivalent

R Crimp tool, AMP P/N 47386, or equivalent

R Crimp tool, AMP P/N 49885, or equivalent

R Crimp tool, MS90413, or equivalent

R Crimp tool, Raychem P/N AD-1377, or equivalent

R Flag terminal, 044557, or equivalent

R Flag terminal, 326872, or equivalent

R Freon, DuPont E1 DeNemours and Co. Inc., P/N T-E35, or
R equivalent

R Heat tool (nitrogen gas), HT900A, or equivalent

R Jumper wire assembly, Simmons Precision P/N 466056

R On aircraft without SB28-087,
R Lockwasher,

	Part Number	Screw Size
R	AN936A-6 or 1706-00	6
R	1708-00	8
R	1710-00	10

R On aircraft with SB28-087,
R Lockwasher,

	Part Number	Screw Size
R	MS35333-71	6
R	MS35333-72	8
R	MS35333-73	10

R Screw, Tri-wing, undercut for captive washer

	Part Number	Screw Size
R	465094-001	6
R	465094-002	8
R	465094-003	10

R Solder, Sn 60 RMA, or equivalent

R Solder Sleeve, P/N NAS1754-3, or equivalent

R Splice, MS25181-1 or M7928/3-2, or equivalent

R Splice kit, Raychem D-150-20, or equivalent

R Tubing, Heat Shrink, 050087-1 Expando Sleeving HR, 1/8 inch, or
R equivalent

R Washer, Captive

	Part Number	Screw Size
R	396973	6
R	396648	8
R	396974	10

R On aircraft without SB28-087,
R Wire, LO Z, C-01-1185-20-9, or equivalent

R On aircraft with SB28-087,
R Wire, LO Z, M22759/34-20-9, or equivalent

R Wire Stripper, Ideal P/N 131-10-237 or Simmons Precision P/N
R 050023-T-1

R 3. Reference Procedures

R Maintenance Manual

R 28-41-00 Fuel Quantity Indicating System - Adjustment and Test

R 28-41-01 Fuel Quantity Probe - Removal and Installation

R Wiring Diagram Manual

R 20-03-05 Heating Tools Maintenance Practices

R 20-03-02 Wire Stripping - Maintenance Practices

R 20-23-01 AMP Termashield Ferrules - Maintenance Practices

R 20-23-02 Raychem Solder Sleeves - Maintenance Practices

R 4. Approved Repairs

R A. Non-Repairable Harnesses

R (1) Replace Harness Assembly if connector housing assembly is damaged (Ref. Fig. 801).

R (2) Replace Harness Assembly if any shielded wire (HI Z) is broken or cut between tank unit 9 and J2 on connector housing assembly or tank unit 15 and J1 on connector housing assembly.

R (3) Replace Harness Assembly if any unshielded wire (LO Z) is broken or cut at connector J1 and/or J2 and a splice cannot be made.

R B. Replacement of HI Z Lead Flag Terminals

R (1) Remove fuel quantity probe (tank unit) from tank (Ref. 28-41-01).

R (2) Disconnect all leads from probe.

R (3) Secure harness to prevent it from dropping back into tank.

R (4) Cover probe access hole in wing to prevent foreign material from entering tank.

R (5) Cut captive washer from HI Z flag assembly and discard. Remove and retain screw and lock washer (Ref. Fig. 803).

R WARNING: DAMAGE TO ANY LEAD CENTER CONDUCTOR, INSULATION OR
R SHIELD WILL CAUSE A MORE EXTENSIVE REWORK OF
R CABLE.

R (6) On aircraft without SB28-087,
R remove HI Z flag terminal from lead as follows:

R (a) Grip flag terminal with pliers, vice or other
R suitable means of securely holding terminal.

R (b) Weaken flag terminal crimp by cutting part way
R through metal opposite flag using file or other
R suitable tool (Ref. Fig. 802). Use caution not to
R nick lead center conductor.

R (c) Pry open flag terminal crimp. Flag terminal
R should bend or break along the line weakened in
R previous Step.

R (6) On aircraft with SB28-087,
R remove HI Z flag terminal from lead as follows:

R NOTE: Flag terminals on aircraft with SB28-087 are
R crimped and soldered.

R (a) Grip flag terminal with pliers, vice or other
R suitable means of securely holding terminal.

R WARNING: USE ONLY APPROVED HEAT SOURCE IN PROXIMITY TO
R OPEN FUEL TANKS.

R (b) Heat flag terminal with HT-900A heat tool (Ref.
R WM20-03-05) and remove solder with solder wick.

R (c) Weaken flag terminal crimp by cutting part way
R through metal opposite flag using file or other
R suitable tool (Ref. Fig. 802). Use caution not to
R nick lead center conductor.

R (d) Pry open flag terminal crimp. Flag terminal
R should bend or break along the line weakened in
R previous Step.

R (7) On aircraft without SB28-087,
R install new P/N 044557 flag terminal on HI Z lead as
R follows:

R (a) determine correct orientation of flag terminal.
R Flag terminal must face in direction illustrated
R in Figure 803 and must allow installation on probe
R without excessive twist of HI Z lead.

R (b) Insert HI Z lead into flag terminal.

R (c) Crimp terminal to lead using AMP P/N 49885 crimp
R tool.

R (7) On aircraft with SB28-087,
R install new P/N 044557 flag terminal on HI Z lead as
R follows:

R (a) determine correct orientation of flag terminal.
R Flag terminal must face in direction illustrated
R in Figure 803 and must allow installation on probe
R without excessive twist of HI Z lead.

R (b) Insert HI Z lead into flag terminal.

R (c) Crimp terminal to lead using AMP P/N 49885 crimp
R tool.

R WARNING: USE ONLY APPROVED HEAT SOURCE IN PROXIMITY TO
R OPEN FUEL TANKS.

R (d) Solder connection using HT-900A heat tool and Sn
R 60 RMA solder.

R CAUTION: Verify HI Z lead flag terminals and washers are
R installed in the correct order with the correct
R orientation.

R (8) Connect all leads to to probe. HI Z leads must be
R placed on screw in the following order; lock washer,
R flag terminal with lead below the plane of the flag,
R captive washer and finally the second flag terminal
R with the lead above the plane of the flag (Ref. Fig.
R 803).

R (9) Remove Probe access hole coverings and verify probe and
R harness is free of FOD.

R (10) Install fuel quantity probe in tank (Ref. 28-41-01).

R (11) Perform Test procedure on probe and harness (Ref.
R 28-41-00).

R C. Shielded (HI Z) Wire Splice

R The following procedure produces an immersion resistant
R in-line splice for fuel gage HI Z shielded wires. It is
R assumed the wires to be spliced are detached from the fuel
R quantity probe and are in an accessible location outside the
R fuel tank. Use Raychem D-150-20 splice kit.

R (1) Slide the shield splicing assembly onto one of the HI Z
R wires to be spliced.

R WARNING: DAMAGE TO ANY LEAD CENTER CONDUCTOR, INSULATION OR
R SHIELD WILL BE CAUSE FOR REJECTION OF SPLICE.

R (2) Prepare both HI Z wires as follows (Ref. Fig. 804):

R (a) Remove outer jacket 2-1/4±1/16 inches from end.

R (b) Remove all except 5/8±1/16 inch of shield.

R (c) Remove primary insulation 5/16 to 11/32 inch from
R end.

R (3) Slide the sealing sleeve onto the other HI Z wire to be
R spliced.

R (4) Insert one conductor into the crimp splicer barrel and
R crimp using a Raychem AD-1377 crimp tool. Repeat for
R other wire.

R (5) Slide sealing sleeve into position so that it is
R centered over the crimp splicer.

R WARNING: USE ONLY APPROVED HEAT SOURCE IN PROXIMITY TO OPEN
R FUEL TANKS.

R (6) Heat each end of the sealing sleeve using HT-900A heat
R tool (Ref. WM20-03-05) until insert melts and flows
R axially along the wire.

R (7) Slide the Shield Splicing Assembly onto the splice so
R that it is approximately centered. Hold braid and
R withdraw the sloder sleeve, leaving the braid in place
R over the splice.

R (8) Milk the braid from center to edges, using an outward
R wiping motion. This will work the jumper into contact
R with the HI Z wire shield; jumper braid ends should
R extend over the cable insulation and be forced down
R with a twisting motion to allow clearance for the
R solder sleeve.

R WARNING: USE ONLY APPROVED HEAT SOURCE IN PROXIMITY TO OPEN
R FUEL TANKS.

R (9) Center the solder sleeve over the assembly. Heat one
R solder ring using a HT-900A heat tool until the solder
R ring melts and flows into the braid. Heat the adjacent
R sealing ring until it flows axially along the cable.
R Pass the sleeve through the heat causing the insulation

R to recover. Heat the second solder ring and sealing
R ring as above.

R (10) Following reinstallation of harness, perform Test
R procedure on probe and harness (Ref. 28-41-00).

R D. Unshielded (LO Z) Wire Crimp Splice:

R It is assumed the wire to be spliced is detached from the
R fuel quantity probe and is in an accessible location outside
R the fuel tank.

R (1) Strip 0.25 inch of insulation from end of each wire
R (Ref. WD20-03-02).

R (2) Insert stripped end of one wire to center stop of
R MS25181-1 or M7928/3-2 splice. Wire shall be visible
R through clear window of splice.

R (3) Position splice in MS90413 hand crimp tool by aligning
R locating rib on splice with locating slot of tool.

R (4) Close handles of tool until they release.

R (5) Reverse splice and repeat steps (2) through (4) for
R remaining wire.

R (6) Following reinstallation of harness, perform Test
R procedure on probe and harness (Ref. 28-41-00).

R E. Termination End Repair of LO Z and HI Z Leads and Jumper
R Assembly

R It is assumed the leads to be repaired are detached from the
R fuel quantity probe and are in an accessible location
R outside the fuel tank.

R NOTE: If harness has only one HI Z lead at location being
R repaired, disregard references to second HI Z lead.
R If jumper assembly is replaced at this location, cut
R off unused lead close to terminal.

R (1) Using wire stripper Ideal P/N 131-10-237 or Simmons
R Precision P/N 050023-T-1 and a short piece of HI Z
R wire, make a test cut as follows (Ref. Fig. 805):

R CAUTION: DO NOT APPLY PRESSURE TO BLADE HEAD. LET THE
R SPRING DO THE WORK. PUSHING HEADS TOGETHER
R MAY RESULT IN WIRE STRANDS BEING CUT OR
R BLADES BEING NICKED.

R (a) Place wire in rear groove of stripper and against
R circular stop.

R (b) Rotate wire stripper down and away (about six
R rotations) (Ref. Fig. 805, View B).

R CAUTION: ROTATING WIRE STRIPPER IN THE OPPOSITE
R DIRECTION MAY CAUSE THE STRIPPER TO "WALK"
R OFF THE WIRE.

R (c) Open wire stripper and remove wire. The wire
R stripper should have made two parallel cuts. The
R cut nearest the end of the wire should be through
R the outer jacket and shield.

R (d) The cut farthest from the wire end should only be
R partially through outer jacket. Bend the wire in
R area of this cut to fracture remainder of jacket.

R CAUTION: DO NOT USE ROUND BLADE TO CUT SHORT SEGMENT
R OF WIRE AS DAMAGE TO THE SHIELD WILL RESULT.

R (e) Using the end blade on the wire stripper, make a
R lengthwise cut through the long segment of wire
R (Ref. Fig. 805, View C).

R (f) Remove outer jacket and shield on long segment.
R If cuter jacket or shield cannot be removed
R easily, replace wire stripper.

R (g) Peel off outer jacket of short segment and closely
R examine the shield to ensure no shield wires were
R nicked or scored at cut (Ref. Fig. 805, View D).
R If shield wires are cut, replace wire stripper.

R (h) Repeat Steps (a) through (g) until a wire stripper
R does not damage shield.

R (2) Using diagonal cutting pliers, cut HI Z leads as close
R to terminal flags as possible.

R (3) Cut jumper assembly leads at solder sleeve (ferrule)
R connections.

R (4) Use wire stripper, strip end of HI Z lead as follows:

R CAUTION: OUTER JACKET OF LEAD IS VERY THIN (0.003 TO
R 0.004 INCH). CONTINUAL INSPECTION IS
R REQUIRED TO ENSURE THERE IS NO NICKING OF
R WIRE STRANDS IN SHIELD. SEE FIGURE 806 FOR
R DETAIL OF WIRE CONSTRUCTION.

R (a) If necessary, set circular stop 0.84-inch from
R right cutting blade (Ref. Fig. 805, View A).

R (b) Orient wire stripper with circular stop to the
R right and the blades pointing up (Ref. Fig. 805,
R View E).

R CAUTION: DO NOT APPLY PRESSURE TO BLADE HEAD. LET THE
R SPRING DO THE WORK. PUSHING HEADS TOGETHER
R MAY RESULT IN WIRE STRANDS BEING CUT OR
R BLADES BEING NICKED.

R (c) Place lead to be stripped in notch under the two
R blades. The blades should be just to rear of the
R solder sleeve (ferrule) when end of lead is
R against the stop (Ref. Fig. 805 View E).

R NOTE: If necessary, cut off end of lead until
R blades are just to rear of solder sleeve
R (ferrule).

R (d) Rotate wire stripper down and away (about six
R rotations) (Ref. Fig. 805, View B).

R CAUTION: ROTATING WIRE STRIPPER IN THE OPPOSITE
R DIRECTION MAY CAUSE THE STRIPPER TO "WALK"
R OFF THE LEAD.

R (e) Open wire stripper and remove lead. The wire
R stripper should have made two parallel cuts. The
R cut nearest the end of the lead (directly to the
R rear of the solder sleeve) should be through the
R outer jacket and shield. Slide solder sleeve or
R ferrule (and cut shield) off the lead and discard
R (Ref. Fig. 805, View F).

R (f) The cut farthest from the lead end should only be
R partially through outer jacket. Bend the lead in
R area of this cut to fracture remainder of the
R jacket (Ref. Fig. 805, View G).

R (g) Peel off outer jacket and closely examine the
R shield to ensure no shield wires were nicked or
R scored at cut (Ref. Fig 805, View D).

R (h) Repeat Steps (b) through (g) for other HI Z lead.

R (5) Ensure correct wire lengths to HI Z and LO Z terminals,
R jumper assembly terminations, heat shrink tubing and
R markers (Ref. Fig. 803). Proceed as follows:

R (a) If necessary, install new markers on HI Z leads
R (Ref. Fig. 803).

R (b) If necessary, install two lengths of heat shrink
R tubing (one over the other) on each HI Z lead
R (Ref. Fig. 803).

R NOTE: The outer heat shrink tube should overlap
R the inner heat shrink tube 0.25-inch on
R each end.

R (c) On harnesses using solder sleeve connections,
R using wire stripper, cut primary insulation by
R placing each lead (HI Z and LO Z), in turn, in the
R notch beneath blades and end of lead in-line with
R blade farthest from circular stop (Ref. Fig. 807,
R View A).

R (c) On harnesses using ferrule connections,
R using wire stripper, cut primary insulation by
R placing each lead (HI Z and LO Z), in turn, in the
R notch beneath blades and end of lead in-line with
R blade farthest from circular stop (Ref. Fig. 808,
R View A).

R (d) Rotate wire stripper down and away about six
R rotations.

R CAUTION: ROTATING WIRE STRIPPER IN THE OPPOSITE
R DIRECTION MAY CAUSE WIRE STRIPPER TO "WALK"
R OFF THE LEAD.

R (e) Open wire stripper and remove lead. Remove
R primary insulation by twisting and pulling with
R fingers.

R (f) Inspect the jumper wire assembly for condition and
R length of leads (Ref. Fig 803). If jumper
R assembly is acceptable, trim leads to length and
R strip 0.25 inch of insulation from end of each
R lead wire. If jumper assembly is not acceptable,
R replace with new jumper assembly P/N 466056 and
R trim and strip leads.

R CAUTION: INCOMPLETE REMOVAL OF FUEL RESIDUES WILL
R PREVENT PROPER SOLDER CONNECTIONS. USE FREON
R T-E35, OR EQUIVALENT, AND CLEAN ALL LEADS TO
R BE REWORKED.

R (g) Inspect HI Z and LO Z leads for dirt, corrosion,
R nicks and breaks or scores of center conductor or

R shields. Defective harness must be cleaned,
R repaired, or replaced.

R (6) On harnesses using solder sleeve connections,
R attach leads of jumper assembly to shields of HI Z
R leads as follows (Ref. WM20-23-02):

R NOTE: This Step may also be used when converting from
R ferrule connection to solder sleeve connection.

R (a) On each HI Z lead, slide a NAS1745-3 solder sleeve
R above exposed shield (Ref. Fig. 807, View B).

R NOTE: NAS1745-3 solder sleeve provides an
R insulated soldered connection. It consists
R of a heat-shrinkable thermoplastic sleeve
R containing a preform of prefluxed solder
R and thermoplastic inserts at each end.
R When placed over a jumper lead and HI Z
R shield and heated, the solder will melt and
R flow to connect the jumper lead and HI Z
R shield. The outer sleeve will shrink and
R the thermoplastic inserts, will melt. The
R result is an encapsulated, strain-reliefed,
R solder connection.

R (b) Slide solder sleeve down and over exposed shield
R wires (Ref. Fig. 807, View C).

R (c) Insert the stripped lead of the jumper assembly
R between the solder sleeve and HI Z shield with the
R end of the jumper assembly lead even with the end
R of the HI Z shield (Ref. Fig. 807, View D).

R NOTE: Ensure 90° tips on jumper assembly terminal
R will be in the up position after soldering
R (Ref. Fig. 803).

R (d) Center solder ring of solder sleeve over shield
R (Ref. Fig. 807, View D).

R CAUTION: ENSURE CLAMP WILL NOT CUT OUTER COVERING OF
R WIRE OR JUMPER LEAD WHEN CLAMPING.

R (e) Using a small clamp, clamp jumper assembly lead
R firmly against HI Z lead with solder ring
R centered.

? WARNING: USE ONLY APPROVED HEAT SOURCE IN PROXIMITY TO
R OPEN FUEL TANKS.

R (f) Heat solder ring using a HT-900A heat tool until
R the sleeve shrinks and solder ring melts and
R flows.

R NOTE: The collapse of the solder ring does not
R indicate solder flow. Continue to apply
R heat until the solder brightens and flows
R around the shield.

R (g) Repeat the above Steps for the other HI Z lead.

R (6) On harnesses using ferrule connections,
R attach leads of jumper assembly to shields of HI Z
R leads as follows (Ref. WM20-23-01):

R (a) On each HI Z lead, slide a GSC149 outer sleeve
R above exposed shield (Ref. Fig. 808, View B).

R (b) Spread shield by rotating center conductor. Slip
R GSB090 inner sleeve between shield and primary
R insulation (Ref. Fig. 808, View C and D).

R (c) Slide outer sleeve down and over shield (Ref. Fig.
R 808, View E).

R (d) Insert the stripped lead of the jumper assembly
R between the outer sleeve and HI Z shield. Align
R aft ends of inner and outer sleeves with jumper
R lead insulation against aft end of sleeves (Ref.
R Fig. 808, View F).

R (e) Using Thomas and Betts crimping tool WT-401, crimp
R inner and outer sleeves together.

R (f) Repeat the above Steps for the other HI Z lead.

R (7) On aircraft without SB28-087,
R install HI Z and LO Z terminal flags as follows:

R (a) Install a P/N 044557 terminal flag on each HI Z
R lead. Terminal flags must be facing each other
R (Ref. Fig. 803).

R (b) Using AMP crimping tool P/N 49885, crimp terminal
R flags to leads.

R (c) On one HI Z terminal flag, install screw, internal
R tooth washer and captive washer (Ref. Fig. 803,
R View B).

R (d) Using a small arbor press with a metal block,
R position screw, with washers and flag, in hole of

R metal block. Using handle on press, draw down
R firmly until captive washer is flattened.

R NOTE: Hole in metal block should be just large
R enough to accept a No. 10 screw. Block can
R then be used with either a No. 8 or No. 10
R screw.

R (e) Install a P/N 326872 terminal flag on LO Z lead
R (Ref. Fig. 803).

R (f) Using AMP crimping tool P/N 47386, crimp terminal
R flag to lead.

R (g) Install screw, internal tooth washer, and captive
R washer in terminal flag (Ref. Fig. 803, View C).

R (h) Using a small arbor press with metal block,
R position screw, with washers and flag, in hole of
R metal block. Using handle on press, draw down
R firmly until captive washer is flattened.

R (7) On aircraft with SB28-087,
R install HI Z and LO Z terminal flags as follows:

R (a) Install a P/N 044557 terminal flag on each HI Z
R lead. Terminal flags must be facing each other
R (Ref. Fig. 803).

R (b) Using AMP crimping tool P/N 49885, crimp terminal
R flags to leads.

R WARNING: USE ONLY APPROVED HEAT SOURCE IN PROXIMITY TO
R OPEN FUEL TANKS.

R (c) Solder connection using HT-900A heat tool (Ref.
R MW20-03-05) and Sn 60 RMA solder.

R (d) On one HI Z terminal flag, install screw, internal
R tooth washer and captive washer (Ref. Fig. 803,
R View B).

R (e) Using a small arbor press with a metal block,
R position screw, with washers and flag, in hole of
R metal block. Using handle on press, draw down
R firmly until captive washer is flattened.

R NOTE: Hole in metal block should be just large
R enough to accept a No. 10 screw. Block can
R then be used with either a No. 8 or No. 10
R screw.

R (f) Install a P/N 326872 terminal flag on LO Z lead
R (Ref. Fig. 803).

R (g) Using AMP crimping tool P/N 47386, crimp terminal
R flag to lead.

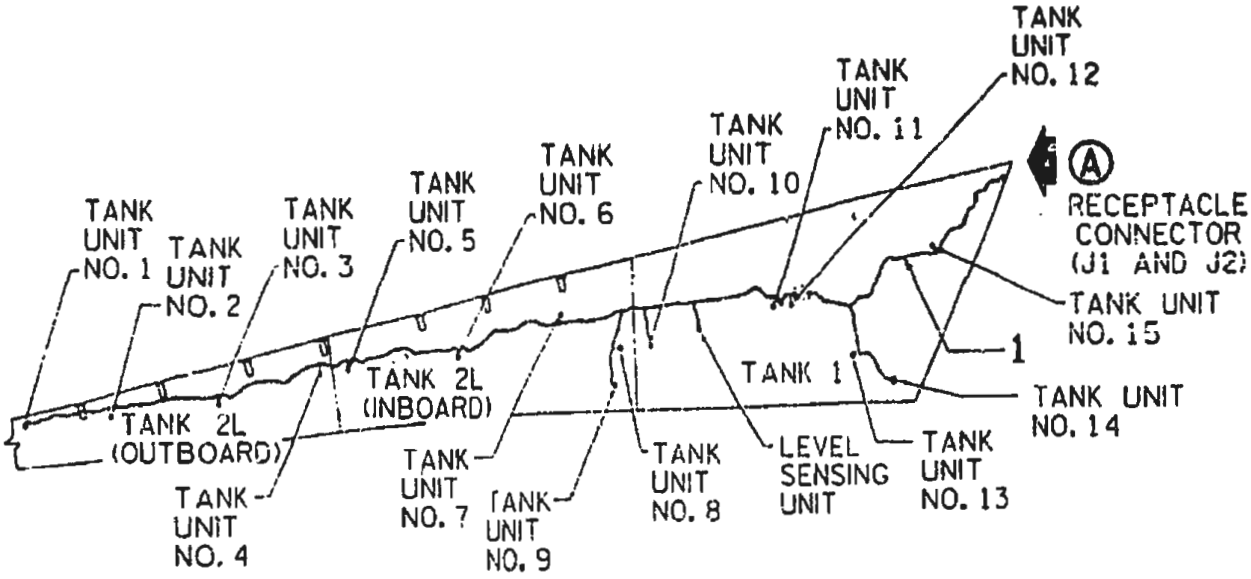
R WARNING: USE ONLY APPROVED HEAT SOURCE IN PROXIMITY TO
R OPEN FUEL TANKS.

R (h) Solder connection using HT-900A heat tool and Sn
R 60 RMA solder.

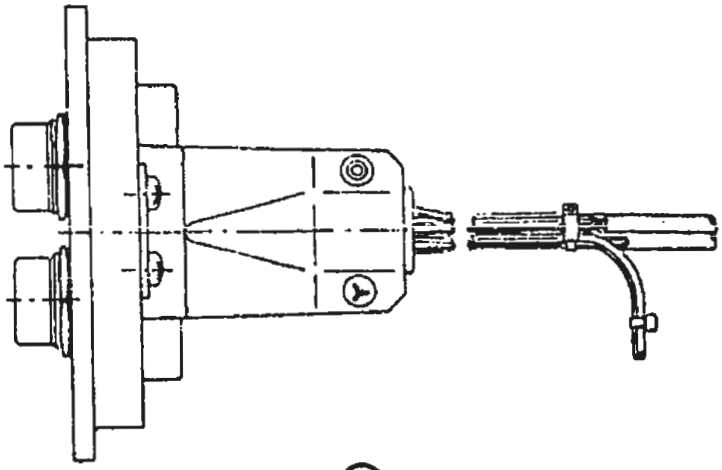
R (i) Install screw, internal tooth washer, and captive
R washer in terminal flag (Ref. Fig. 803, View C).

R (j) Using a small arbor press with metal block,
R position screw, with washers and flag, in hole of
R metal block. Using handle on press, draw down
R firmly until captive washer is flattened.

R (8) Following reinstallation of harness, perform Test
R procedure on probe and harness (Ref. 28-41-00).



LEFT WING HARNESS ASSEMBLY LOCATION SHOWN
RIGHT WING HARNESS ASSEMBLY LOCATION OPPOSITE

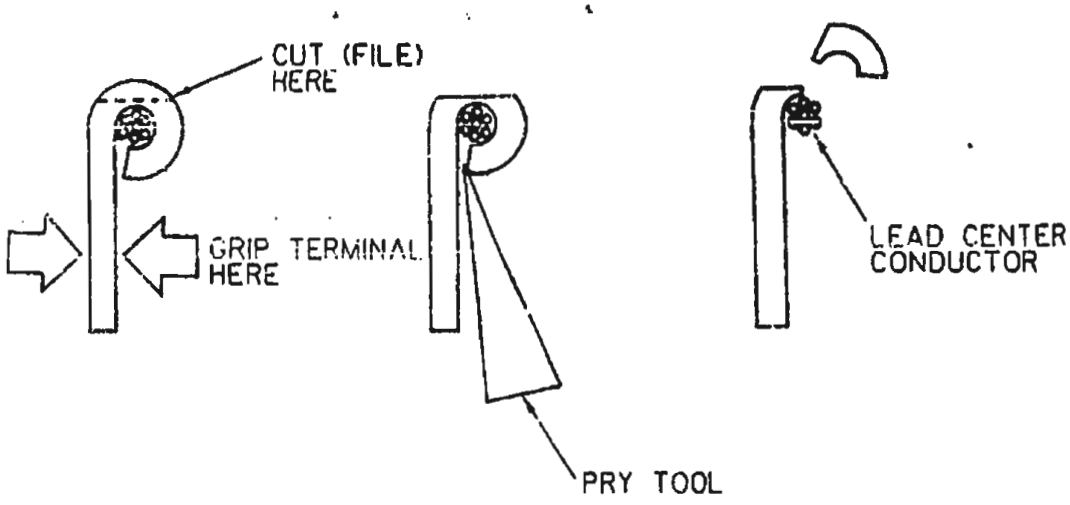


A
RECEPTACLE CONNECTOR
(J1 AND J2)

MI-0000-28-1932

R Fuel Quantity Tank Probe Harness Assembly
R Figure 801

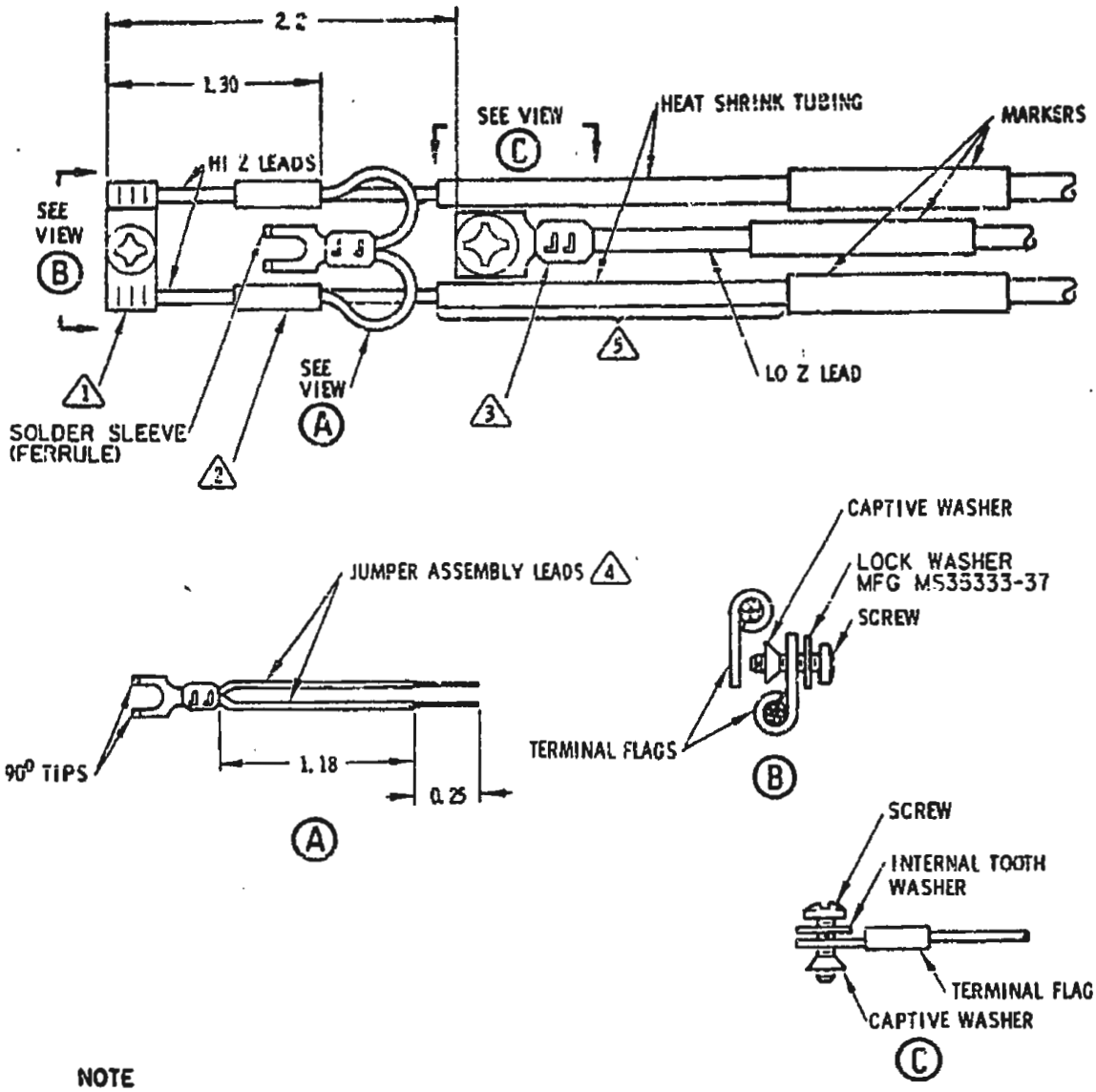
R EFFECTIVITY: ALL
R
001B



MI-0000-28-1933

R
R
Flag Terminal Removal
Figure 802

R EFFECTIVITY: ALL
R
001B



NOTE

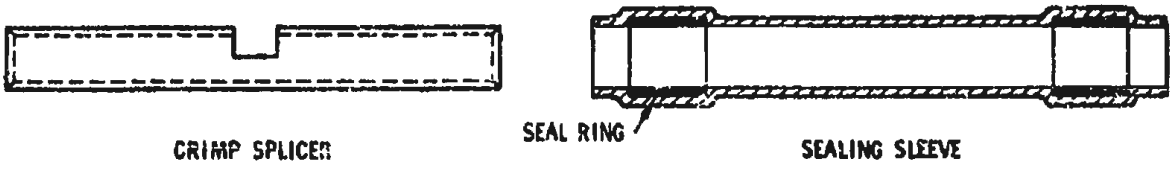
1. FLAGS MUST FACE IN DIRECTION ILLUSTRATED. USE AMP CRIMPING TOOL, PAR NO. 49885.
2. 90° TIPS MUST BE IN THE UP POSITION AFTER SOLDER SLEEVES ARE SOLDERED AND JUMPER ASSEMBLY LEADS ARE BENT BACK.
3. USE AMP CRIMPING TOOL, PART NO. 47386.
4. IF REQUIRED, TRIM JUMPER ASSEMBLY LEADS TO MEET DIMENSIONAL REQUIREMENTS.
5. INSTALL TWO LENGTHS OF HEAT SHRINK TUBING ON EACH HI Z LEAD (ONE OVER THE OTHER) IN THIS AREA.

MI-0000-28-1936

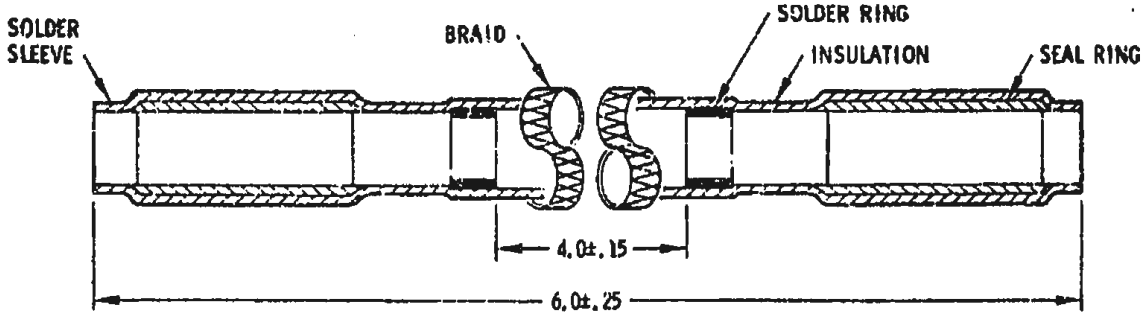
CR
CR

Wire Termination Template
Figure 803

R EFFECTIVITY: ALL
R
001B



I CENTER CONDUCTOR SPLICING ASSEMBLY



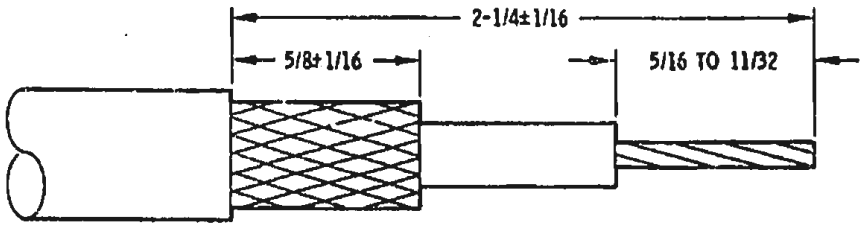
SOLDER SLEEVE WITH JUMPER BRAID

II SHIELD SPLICING ASSEMBLY

MATERIALS:

I CONDUCTOR SPLICING ASSEMBLY
- 1 CRIMP SPLICER: COPPER ALLOY 102 PER WW-T-775. TIN COATED PER MIL-T-10727, TYPE I.
- 2 SEALING SLEEVE: HEAT SHRINKABLE, RADIATION CROSS-LINKED, TRANSPARENT BLUE MODIFIED POLYVINYLIDENE FLUORIDE WITH INTEGRAL IMMERSION RESISTANT THERMOPLASTIC SEALING RINGS.

II BRAID SPLICING ASSEMBLY
- 3 SOLDER SLEEVE: HEAT SHRINKABLE, RADIATION CROSS-LINKED, TRANSPARENT BLUE MODIFIED POLYVINYLIDENE FLUORIDE CONTAINING TWO EACH SN 63 (QQ-S-571) SOLDER RINGS COATED WITH TYPE RMA (MIL-F-14256) FLUX AND IMMERSION RESISTANT THERMOPLASTIC SEALING RINGS.
- 4 JUMPER BRAID: TIN PLATED COPPER WIRES.

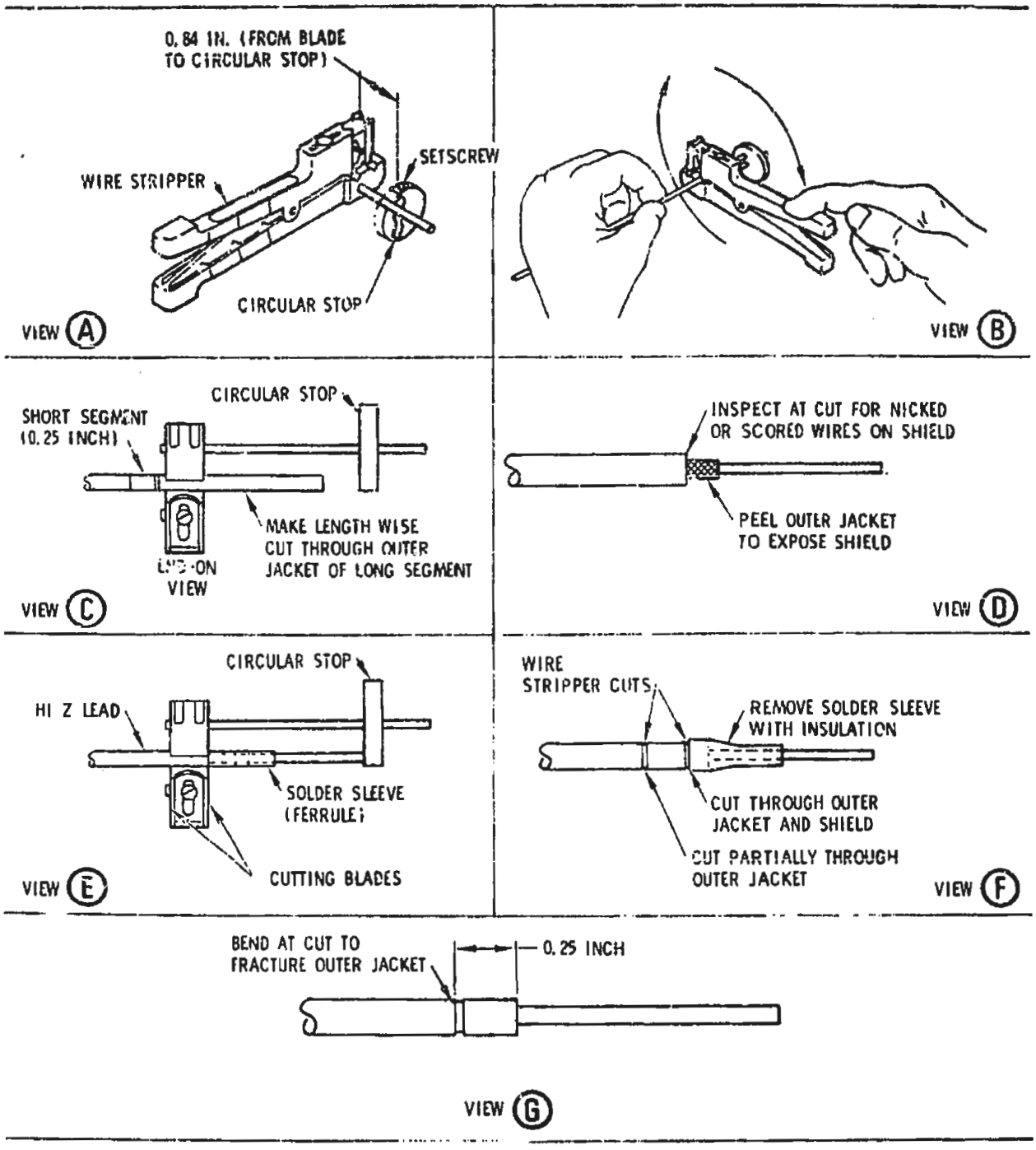


III CABLE PREPARATION

M1-0000-28-1644

R HI Z Fuel Gage Shielded Wire Splice
R Figure 804

R EFFECTIVITY: ALL
R
001B

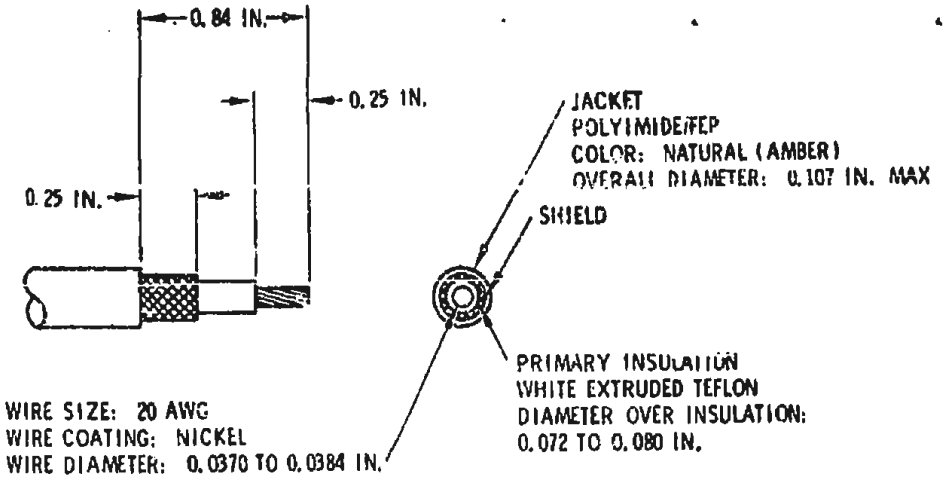


M1-0000-28-1723

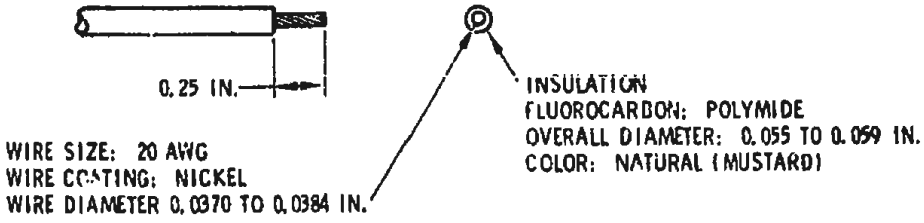
R Test Cut and Removal of Solder Sleeve (Ferrule)
R Figure 805

R EFFECTIVITY: ALL
R
001B

HI Z LEADS ARE JACKETED, SHIELDED, ELECTRIC WIRE USING A NICKEL PLATED COPPER CONDUCTOR



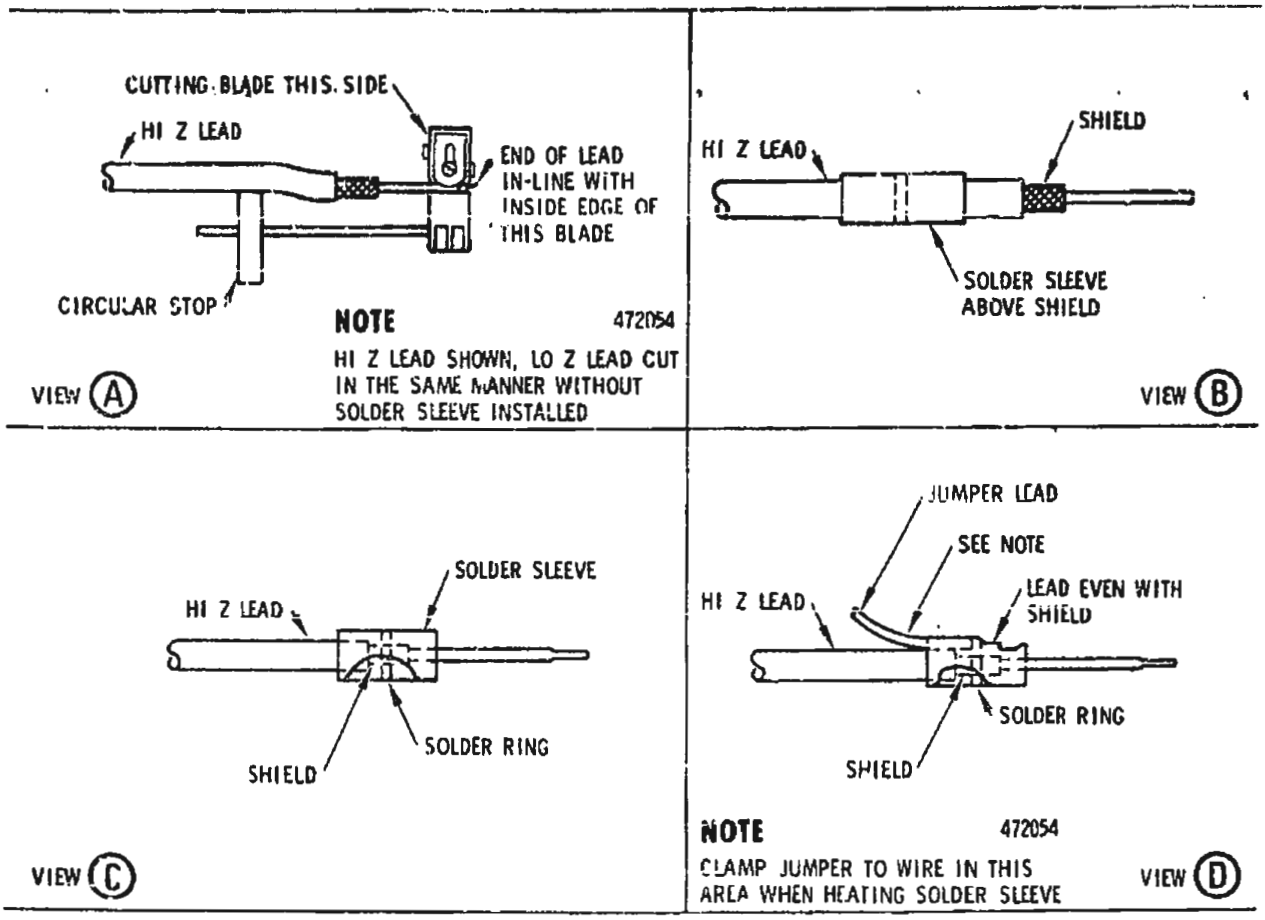
LO Z LEADS ARE INSULATED ELECTRIC WIRE USING A NICKEL PLATED COPPER CONDUCTOR



MI-0000-28-1724

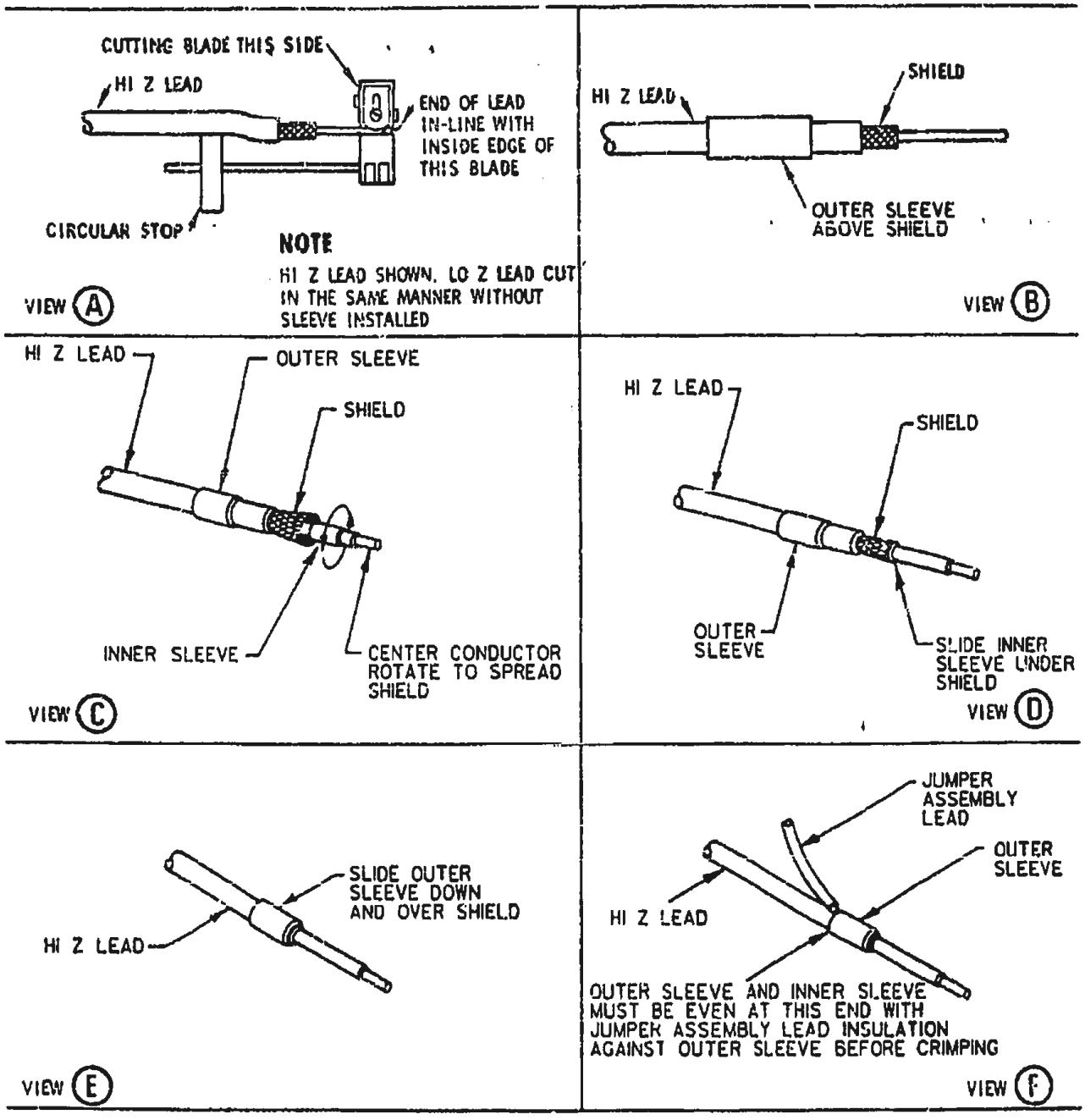
R HI Z and LO Z Cable Construction
R Figure 806

R EFFECTIVITY: ALL
R
001B



MI-0000-28-1726

R Preparation of and Installation of Solder Sleeves
R Figure 807


CUTTING BLADE THIS SIDE
HI Z LEAD
END OF LEAD IN-LINE WITH INSIDE EDGE OF THIS BLADE
CIRCULAR STOP
NOTE
HI Z LEAD SHOWN. LO Z LEAD CUT IN THE SAME MANNER WITHOUT SLEEVE INSTALLED
VIEW A
HI Z LEAD
SHIELD
OUTER SLEEVE ABOVE SHIELD
VIEW B
HI Z LEAD
OUTER SLEEVE
SHIELD
INNER SLEEVE
CENTER CONDUCTOR ROTATE TO SPREAD SHIELD
VIEW C
HI Z LEAD
SHIELD
OUTER SLEEVE
SLIDE INNER SLEEVE UNDER SHIELD
VIEW D
SLIDE OUTER SLEEVE DOWN AND OVER SHIELD
HI Z LEAD
VIEW E
JUMPER ASSEMBLY LEAD
OUTER SLEEVE
HI Z LEAD
OUTER SLEEVE AND INNER SLEEVE MUST BE EVEN AT THIS END WITH JUMPER ASSEMBLY LEAD INSULATION AGAINST OUTER SLEEVE BEFORE CRIMPING
VIEW F

MI-0000-28-1935

R R Preparation of and Installation of Ferrule Connectors
Figure 808

R R 001B EFFECTIVITY: ALL

VARIABLE CAPACITOR TRIMMER UNIT - REMOVAL AND INSTALLATION

1. Referenced Procedure

24-00-00	Electrical Power System - Maintenance Practices
28-41-00	Fuel Quantity Indicating System - Adjustment and Test

2. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag circuit breakers FUEL QTY IND - TEST, 1, 2L, 2R, and 3 (T1 through T5).

R On galley right circuit breaker panel, zone 130, open and tag circuit breaker FUEL SYS GA RPTR IND (G19).

R (2) In mid electrical service center, zone 137, disconnect
R P10 and P11 wiring harness plugs at variable capacitor
R trimmer unit (VCTU) (Ref. 28-41-00, Adjustment and
R Test, Figure 201).

R (3) Remove VCTU support screws.

R (4) Remove VCTU.

B. Installation

(1) Verify that circuit breakers opened in Step 2A(1) are open and tagged.

R (2) Hold VCTU in its installed position and install support
R screws.

R (3) Connect P10 and P11 wiring harness plugs and add
R lock-wire.

(4) Remove tags and close circuit breakers opened in Step 2A(1).

R (5) Apply external electrical power (Ref. 24-00-00).

R (6) Adjust VCTU trimmer capacitors (Ref. 28-41-00,
R Adjustment and Test).

R R (7) Remove fuel quantity system calibration equipment and turn off electrical power (Ref. 24-00-00).

FUEL SYSTEM PANEL FUEL QUANTITY INDICATOR - REMOVAL AND INSTALLATION

1. General

Removal and installation procedures are identical for all FUEL SYSTEM panel fuel quantity indicators.

2. Referenced Procedure

24-41-00 External Power/Ground Service System - Maintenance Practices

3. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag circuit breakers FUEL QTY IND - TEST, 1, 2L, 2R, and 3 (T1 through T5).

(2) On FUEL SYSTEM panel, release clamp tension screw and remove indicator.

(3) Remove electrical harness plug from indicator connector at rear of indicator (Ref. Fig. 401).

B. Installation

(1) Verify that circuit breakers opened in Step 3A(1) are open and tagged.

(2) Connect electrical harness plug to indicator connector. Tighten plug finger-tight.

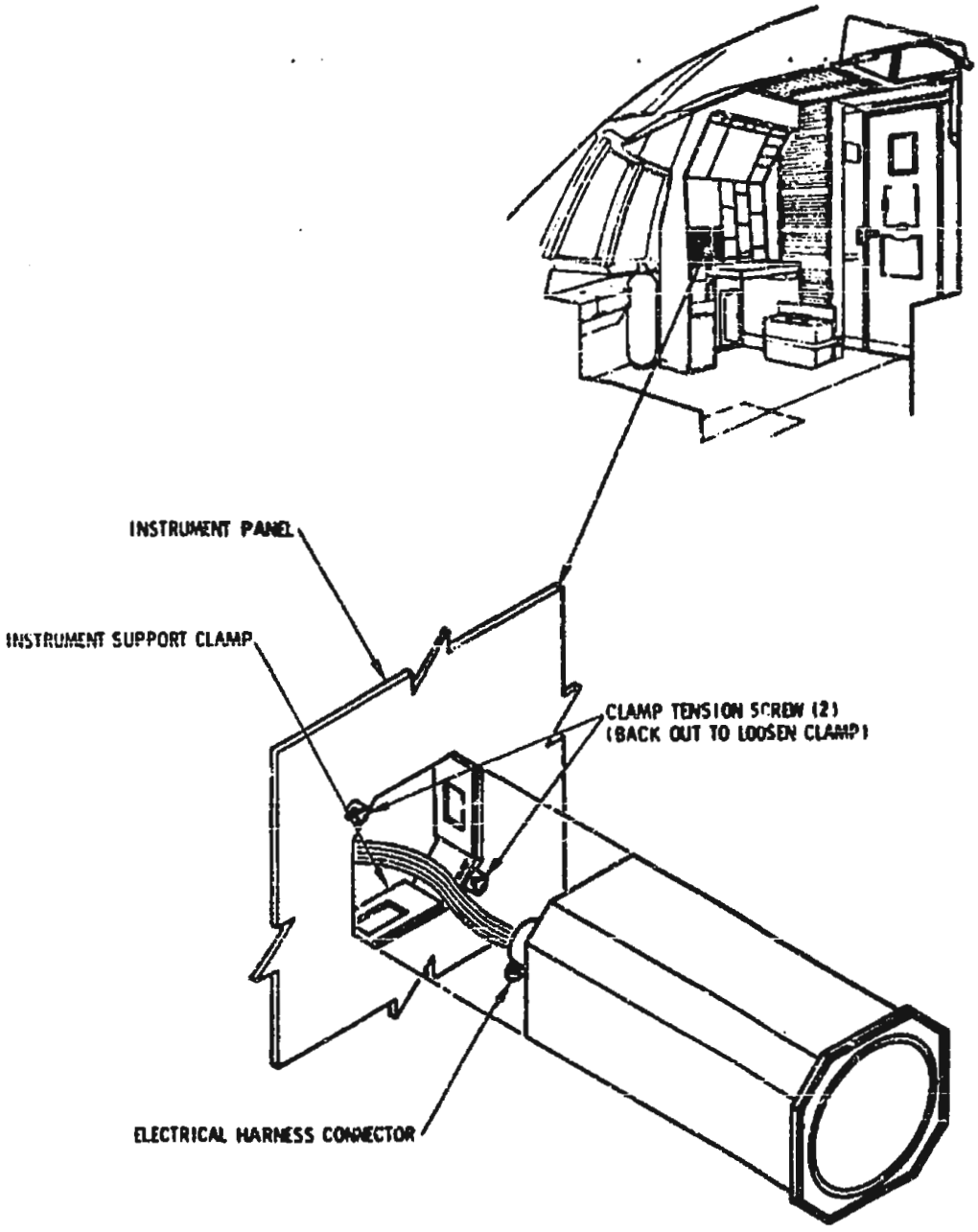
(3) Position indicator in panel opening and secure with clamp tension screws.

(4) Remove tags and close circuit breakers opened in Step 3A(1).

(5) Turn on electrical power (Ref. 24-41-00).

(6) On FUEL SYSTEM panel, depress and hold QUANTITY TEST switch until indicator pointer reads full scale.

(7) Release switch; each indicator pointer must return to a position which indicates amount of fuel remaining in its respective tank.



K1-0100-28-357

R FUEL SYSTEM Panel Fuel Quantity Indicator
R Removal and Installation
R Figure 401

C (8) Perform drip stick check of applicable tank. Insure
C stick reading is within ± 4% of indicator reading. The
C dripstick is not valid unless aircraft level attitude
C in pitch and roll is known and corrected to within 1/4
C degree either way by use of dripstick chart.

C NOTE: If tank has insufficient fuel for dripstick
CR reading, perform check after aircraft fueling.

R (9) Turn off electrical power (Ref. 24-41-00).

FUEL QUANTITY TOTALIZER INDICATOR - REMOVAL AND INSTALLATION

1. Referenced Procedure

R 24-00-00 Electrical Power System - Maintenance Practices

2. Removal/Installation

A. Removal

(1) R On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag circuit breakers FUEL QTY IND - TEST 1, 2L, 2R, 3 (T1 thru 5).

On Flight Engineer/Second Officers overhead circuit breaker panel, CB2, zone 210, open and tag circuit breaker F/E INSTR (E9).

(2) On FUEL SYSTEM panel, zone 215, loosen indicator support clamp and pull indicator out of panel.

(3) Disconnect electrical harness at rear of indicator (Ref. Figure 401).

B. Installation

(1) Verify that circuit breakers opened in Step 2A(1) are open and tagged.

(2) Connect electrical harness to indicator connector. Tighten plug finger-tight.

(3) Insert indicator in panel and tighten indicator support clamp.

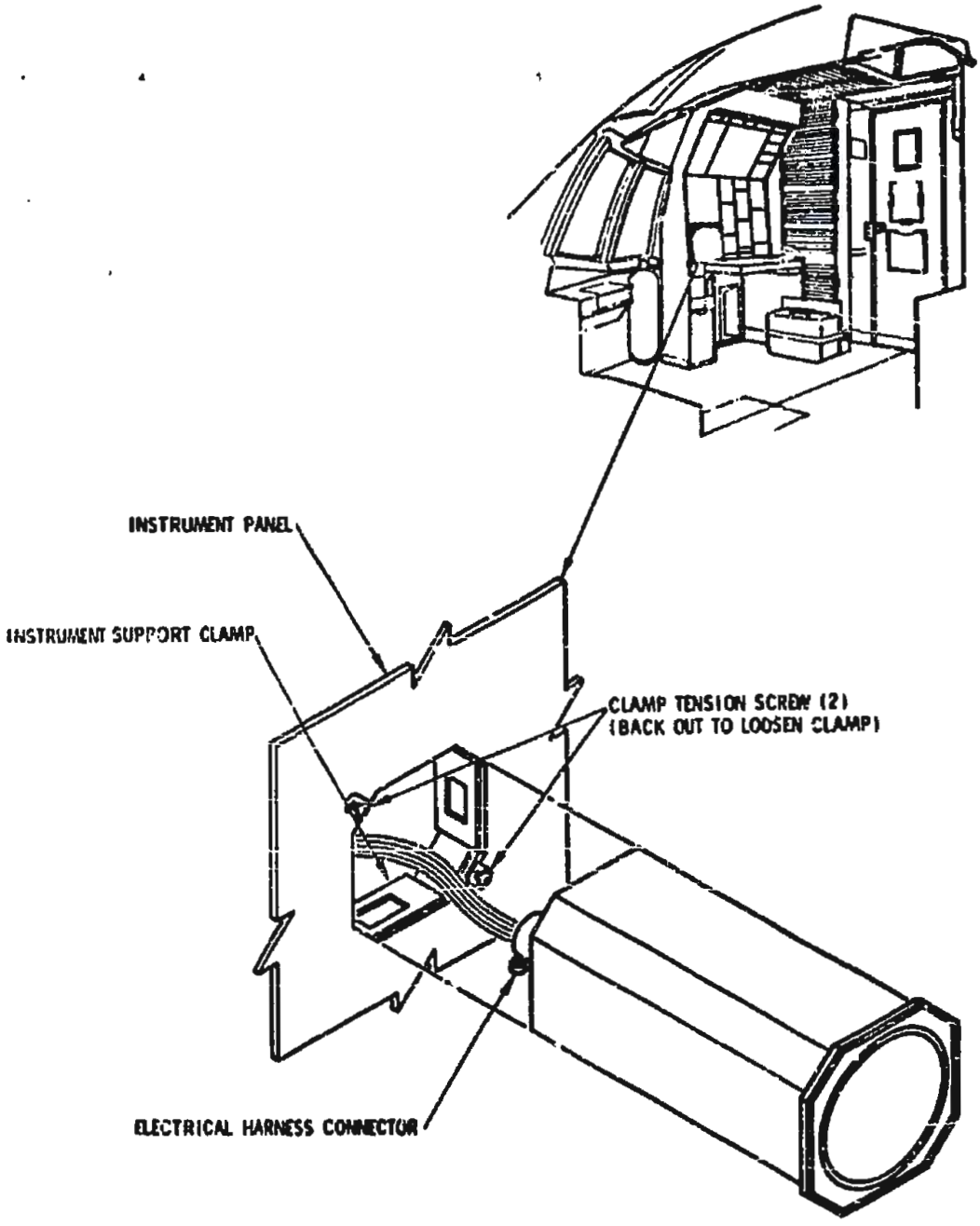
(4) Remove tags and close circuit breakers opened in Step 2A(1).

R (5) Turn on electrical power (Ref. 24-00-00).

(6) On FUEL SYSTEM panel, depress and hold QUANTITY TEST switch. Verify that indicator TOTAL FUEL counter drives upscale.

(7) Release switch. Verify indicator TOTAL FUEL counter drives downscale to previous reading.

(8) Turn on Flight Engineer/Second Officers instrument lights. Verify that indicator integral lights come on.



M1-0100-28-357

R Fuel Quantity Totalizer Indicator - Removal and Installation
R Figure 401

R (9) Turn off electrical power (Ref. 24-00-00).

FUELING/DEFUELING PANEL FUEL QUANTITY INDICATOR MAINTENANCE PRACTICES

1. General

The following procedure should be performed if aircraft is dispatched with fueling/defueling panel fuel quantity gage inoperative.

2. Deactivation

R NOTE: This deactivation procedure applies only when an aircraft
R is to be dispatched in accordance with the MEL.

A. Fueling/Defueling Panel Fuel Quantity Gage

(1) Attach inoperative placard to faulty fuel quantity gage. If possible, placard should describe fault.

(2) Make appropriate aircraft log book entry.

FUELING/DEFUELING PANEL FUEL QUANTITY INDICATOR REMOVAL AND INSTALLATION

1. General

Removal and installation procedures are identical for all fueling/defueling panel fuel quantity indicators.

2. Referenced Procedure

24-00-00 Electrical Power System - Maintenance Practices

3. Removal/Installation

A. Removal

R (1) Open fueling/defueling panel access door 621FB.

R (2) Verify that panel SYSTEM POWER Switch is OFF.

R (3) Release clamp tension screw and remove indicator.

(4) Disconnect electrical connector from receptacle at rear of indicator (Ref. Fig. 401).

B. Installation

(1) Verify that circuit breaker opened in Step 3A(1) is open and tagged.

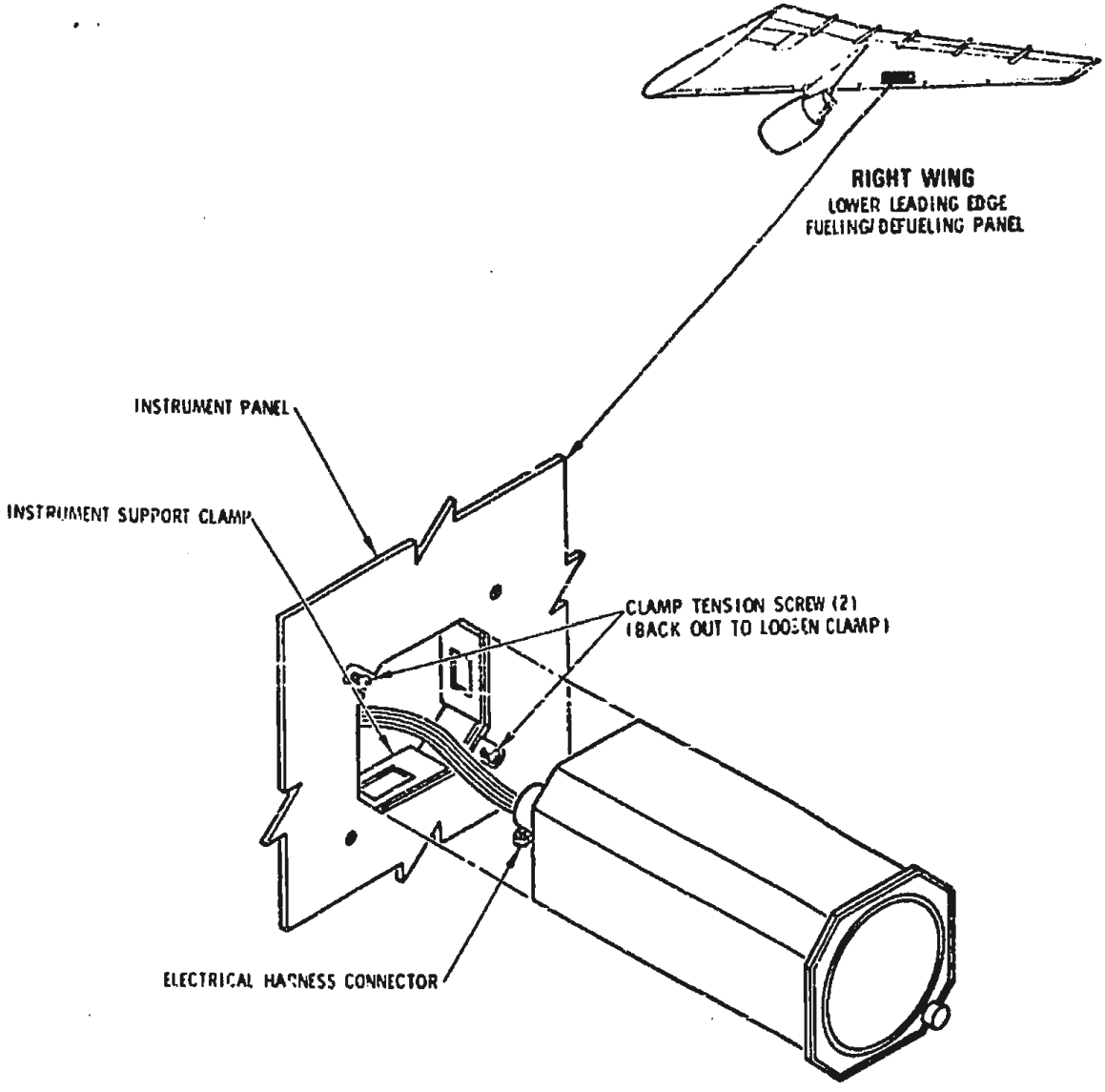
(2) Connect electrical connector to indicator receptacle. Tighten plug finger-tight.

(3) Position indicator in panel opening and secure with clamp tension screw. Torque to a value of 5 to 8 inch pounds.

(4) Remove tag and close circuit breaker opened in Step 3A(1).

(5) Turn on electrical power (Ref. 24-00-00).

(6) On fueling/defueling panel, place SYSTEM POWER switch in ON position, depress GAUGES TEST switch and hold until indicator pointer reads full scale.



M1-0100-28-358

R Fueling/Defueling Panel Fuel Quantity Indicator
R Removal and Installation
R Figure 401

EFFECTIVITY: ALL

001B

(7) Release switch; each indicator pointer must return to a position which indicates amount of fuel remaining in its respective tank.

(8) Place SYSTEM POWER switch in OFF position.

R (9) Turn off electrical power (Ref. 24-00-00).

FUEL LEVEL SIGHT GAGE - MAINTENANCE PRACTICES

1. General

The following deactivation procedure is applicable to an inoperative fuel level sight gage.

2. Equipment and Materials

Installation Tool, APCO 727793T, or equivalent

3. Referenced Procedure

28-41-24 Fuel Level Sight Gage - Removal and Installation

4. Deactivation

R NOTE: This deactivation procedure applies only when an aircraft
R is to be dispatched in accordance with the MEL.

A. If sight gage is inoperative due to a broken calibrated stick or malfunction that prevents proper operation of the stick, remove the stick (Ref. 28-41-24, Removal and Installation) and reinstall the bayonet head. Enter item in aircraft maintenance log and install appropriate placard in flight station.

B. If sight gage is inoperative because the calibrated stick does not remain securely locked in the stowed position, retract the stick and apply a patch of high adhesion tape over the bayonet head and socket. Also use this method if the lower portion of the stick has been broken off and lost, and a replacement bayonet head is not available. Enter the item in aircraft maintenance log and install appropriate placard in flight station.

WING TANK FUEL LEVEL SIGHT GAGE - REMOVAL AND INSTALLATION

1. Equipment and Materials

Installation Tool, APCO 727793TA, or equivalent

Adhesive, Poxy-Hesive No. 1191 (Permalite Plastic Co., Costa Mesa, Calif.), or equivalent

Adhesive, Buna-N Rubber Base, MIL-A-5092 Type III, or equivalent

O-ring (Ref. Fig. 401)

Grease, Dow Corning FS-1291 Fluorosilicone, or equivalent

Gasket (Ref. Fig. 401)

Release Agent, LCM22-1246 (Ram Mold Release No. 225, Ram Chemical Co., Gardena, Ca.), or equivalent

Sealant Gun, LAC 290B6-2 (Semco Research Co., Model 250), or equivalent

R Sealant Compound, LMC 40-2180 Type I, LMC 40-1218 Type I, or
R equivalent (Ref. 28-11-00,201)

2. Referenced Procedures

12-11-00	Servicing - Maintenance Practices
28-11-00	Fuel Tanks - Maintenance Practices
28-22-00	Defueling - Maintenance Practices

3. Removal/Installation

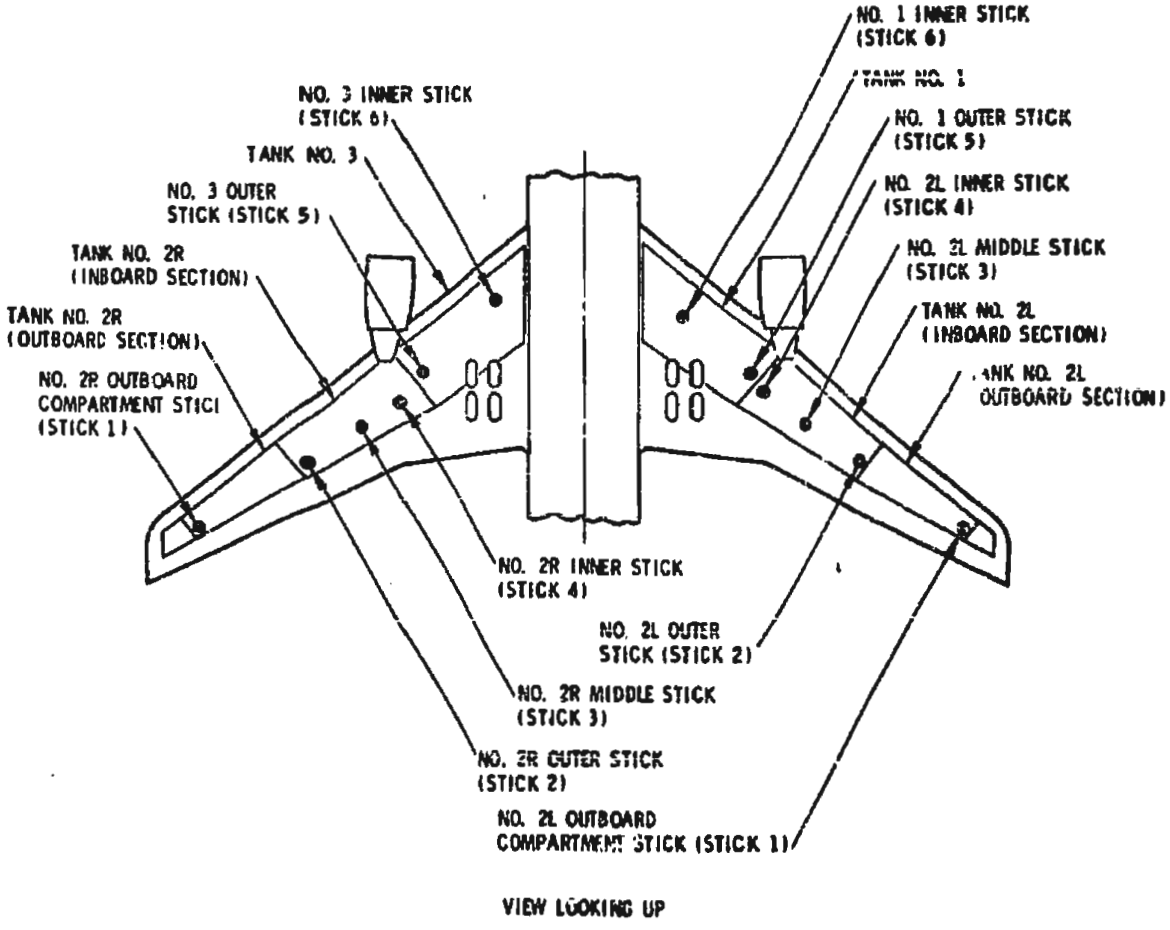
A. Sight Gage Assembly Removal

NOTE: For location of sight gages, refer to Figure 401

In following step, ventilation of fuel tank is required only if personnel must enter tank to effect replacement of sight gage.

(1) Defuel and ventilate fuel tank (Ref. 28-11-00).

(2) Remove fuel sight gages listed below as follows (Ref. Fig. 401):



M1-0100-28-324

R Wing Tank Fuel Level Sight Gage Locations
R Figure 401

Tank 1 and 3

No. 1 Inner and Outer Sticks

No. 3 Inner and Outer Stick

Tank 2L and 2R

2L and 2R Outer Sticks

(a) Remove calibrated stick (Ref. Step 3C).

(b) Using 9/16-inch hex stock and wrench, unscrew housing out of mounting base. Do not allow housing to extend completely out of support base until Step C is done (Ref. Fig. 402).

(c) Remove 5 mounting ring attach screws.

(d) Completely unscrew housing and allow it to extend enough to permit disengagement of housing from retainer at top of tank.

(e) Enter or reach into tank and remove sight gage assembly.

(f) Reinstall housing and replace calibrated stick in removed sight gage assembly.

(3) Remove fuel sight gages listed below as follows (Ref. Fig. 402):

Tank 2L and 2R

2L and 2R Inner Sticks

2L and 2R Middle Sticks

(a) Remove five mounting ring attach screws (Ref. Fig. 402).

(b) Enter or reach into tank and remove sight gage.

(4) Break sealant bond to dislodge and remove mounting ring.

(5) Remove sealant and clean mounting ring and attach screws. Be sure sealant is removed from sealant injection hole in mounting ring.

(6) Remove sealant and thoroughly clean edges of hole in wing skin.

B. Sight Gage Assembly Installation

(1) Install fuel sight gages listed below as follows (Ref. Fig. 402):

Tank 1 and 3

No. 1 Inner and Outer Sticks

No. 3 Inner and Outer Sticks

Tank 2L and 2R

2L and 2R Outer Sticks

(a) Remove calibrated stick (Ref. Step 3C).

(b) Using 9/16-inch hex stock and wrench, unscrew housing out of mounting base.

(c) Bond gasket to sight gage base using Buna-N rubber base adhesive (Ref. Fig. 402).

(d) Apply a film of release agent LCM 22-1246 to all faying surface areas of the sight gage base except that area just inside the gasket that will be in contact with the wing skin. This area must make clean metallic contact with the wing skin to assure adequate electrical bonding.

(e) Apply a film of release agent to all surfaces of the mounting base attach screws.

NOTE: Do not apply release agent to mounting ring. There must be clean metallic contact between inside lip at edge of ring and wing skin.

(f) Place sight gage in its installed position. Allow housing to extend as required to permit mounting of the assembly.

(g) While second man (below wing) carefully screws housing into mounting base, guide top of housing into the retainer at the top of the tank.

(h) Install mounting ring. Do not apply sealant to screws (Ref. Fig. 402).

(i) Screw in housing until it bottoms out in the mounting base.

(j) Install calibrated stick (Ref. Step D).

(2) Install Tank 2L and 2R inner and middle fuel sight gages as follows (Ref. Fig. 402):

(a) Perform Steps 3B(1c) through 3B(1e).

(b) Place sight gage in its installed position.

(c) Install mounting ring. Do not apply sealant to screws (Ref. Fig. 402).

(3) Clear the tank and install tank access cover.

(4) R Using Semco type sealant gun equipped with injection nozzle, inject sealant (Ref. 28-11-00, Para. 7) through holes in mounting ring until cavity between mounting ring and sight gage base is completely filled.

(5) Allow sealant to cure (Ref. 28-11-00).

(6) Refuel tank and check for leakage.

(7) Check calibrated stick for free movement to its fully extended position and for positive magnetic coupling with float.

C. Calibrated Stick Removal

(1) Release calibrated stick (Ref. Fig. 402) by depressing and rotating bayonet head 90 degrees counterclockwise.

(2) Firmly hold the stick and pull off the bayonet head.

(3) Push the stick back into the sight gage housing.

(4) Using installation tool, remove bayonet socket, spring retainer, and spring.

(5) Gently pull on extended stick to dislodge the stick guide. Remove stick and guide.

D. Calibrated Stick Installation

NOTE: Before installing stick, check removed parts for general condition. Inspect stick for legibility of calibration marks, distortion, and condition of teflon bearings on armature at upper end of stick. Replace spring if distorted. Free length of spring must be 0.98 to 1.04 inches. When compressed to 0.375 inches, spring force must be 4.75 to 5.25 pounds. Replace bayonet head or socket if locking

lugs on head or cam lock surfaces in socket are distorted, worn, or damaged.

(1) Install new O-ring on socket (Ref. Fig. 402).

(2) Inspect teflon ring in center of socket and replace if worn or distorted.

(3) Install guide, spring, and spring retainer (in order listed) on stick.

(4) Install stick and assembled parts in housing.

(5) Using installation tool, install and tighten socket until it bottoms flush with mounting base.

(6) Allow stick to extend and snap bayonet head on ball joint.

(7) Fully extend and retract stick. Check for binding.

(8) Insert bayonet head and rotate clockwise to fully locked position. When locked the slot in the head will be aligned with the two holes in the socket surface.

E. Housing Removal

NOTE: The sight gage housing may be replaced on the aircraft, without disturbing the sealed mounting base and ring, if fuel seepage around the bayonet socket requires replacement of a damaged housing or faulty housing O-ring. (Fuel seepage around the mounting ring, however, can be corrected only by resealing or replacement of the sight gage mounting base.)

In following step, ventilation of tank is required only if personnel must enter tank to reach the sight gage float and housing.

(1) Defuel and ventilate the tank (Ref. 28-11-00 and 28-22-00).

(2) Remove calibrated stick (Ref. Step 3C).

(3) Using 9/16-inch hex stock and wrench, unscrew housing out of mounting base and allow housing to extend below the wing.

(4) Using a suitable tool, remove the dab of adhesive at both ends of the upper float stop retaining pin (Ref. Fig. 402).

NOTE: Removal of float stop will allow housing to drop out of the sight gage mounting base. Have assistant standing by below the wing to hold the housing.

(5) Carefully drive out the float stop retaining pin. Remove float stop and float.

(6) Remove housing.

F. Housing Installation

(1) Lubricate new O-ring with grease and install on new housing (Ref. Fig. 402).

(2) Insert housing into mounting base.

(3) Enter or reach into tank and install float and upper float stop. Verify that float moves freely throughout length of housing.

(4) Secure float stop to housing using new retaining pin. Apply a dab of poxy-hesive (or equivalent adhesive) to both ends of pin.

CAUTION: WHEN INSTALLING HOUSINGS THAT ENGAGE RETAINING BRACKETS AT THE TOP OF THE TANK, HAVE SECOND MAN IN THE TANK GUIDE UPPER END OF HOUSING INTO RETAINER.

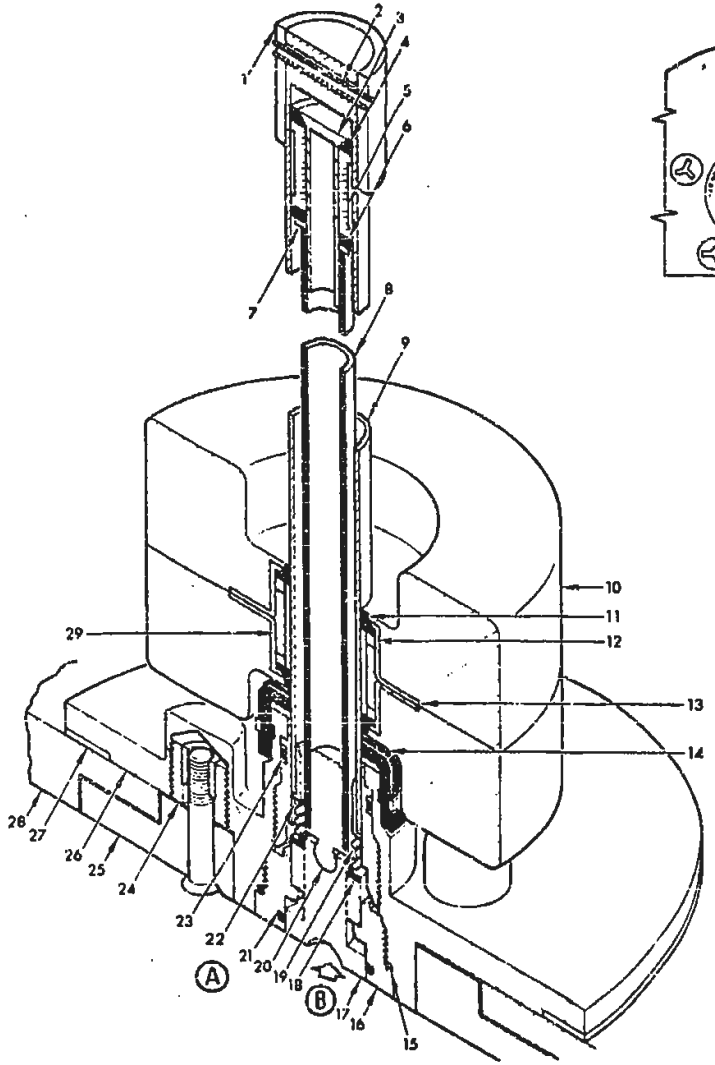
(5) Using 9/16-inch hex stock, screw in housing until it bottoms.

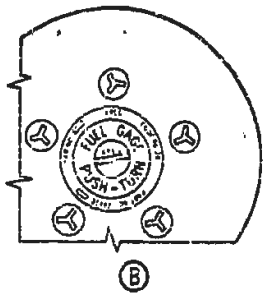
(6) Reinstall calibrated stick (Ref. Step 4D).

(7) Reinstall tank access cover and refuel tank, with calibrated stick extended (Ref. 12-11-00).

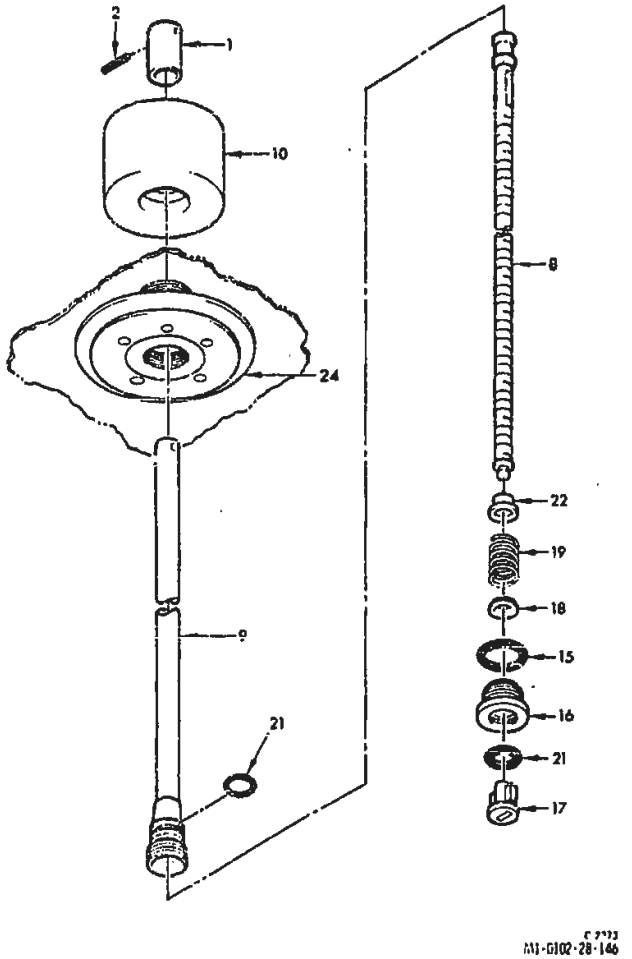
(8) Verify that calibrated stick retracts with rising fuel level. Check for fuel seepage at bayonet socket.

(9) Insert bayonet head and rotate clockwise to fully locked position.





1. UPPER FLOAT STOP
2. FLOAT RETAINING PIN
3. ARMATURE RETAINER
4. UPPER ARMATURE BEARING
5. ARMATURE
6. LOWER ARMATURE BEARING
7. WASHER
8. CALIBRATED STICK
9. HOUSING
10. FLOAT
11. FLOAT BEARING
12. POLE PIECE
13. MAGNET RETAINER
14. LOWER FLOAT STOP
15. O-RING
16. BAYONET SOCKET
17. BAYONET HEAD
18. SPRING RETAINER
19. SPRING
20. BALL JOINT
21. TEFLON RING
22. GUIDE
23. O-RING
24. FLOATING INSERT
25. MOUNTING RING
26. MOUNTING BASE
27. GASKET
28. WING SKIN PANEL
29. MAGNET



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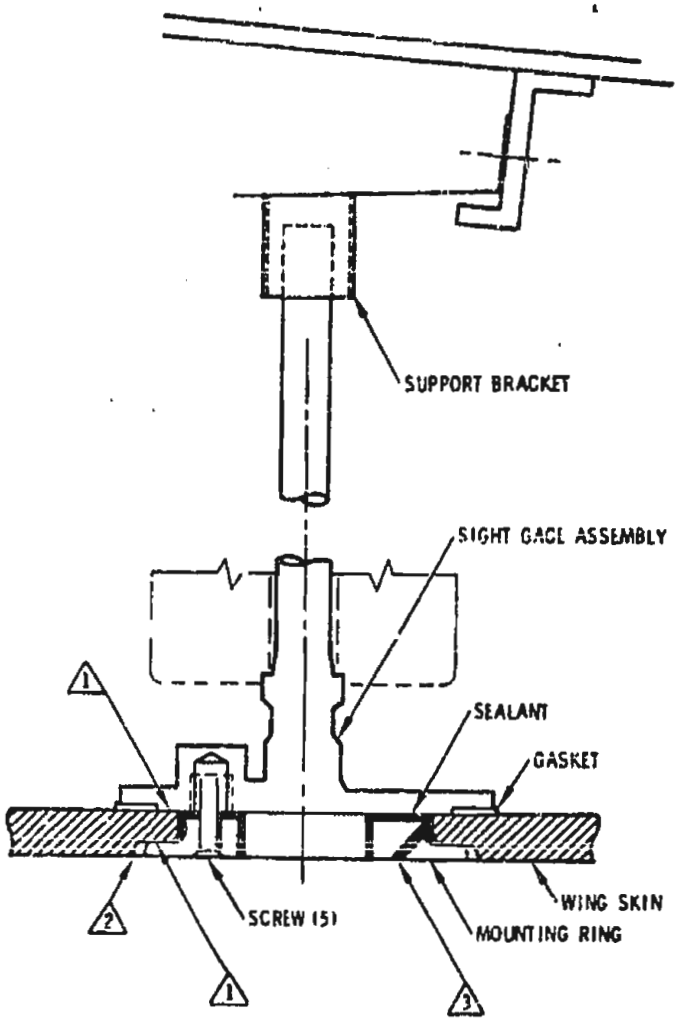
R Fuel Level Sight Gage - Removal and Installation
R Figure 402 (Sheet 1)

EFFECTIVITY: ALL

001B



NOTE

1. MAINTAIN CLEAN METALLIC CONTACT FOR ELECTRICAL BOND
2. AERODYNAMIC SMOOTHING COMPOUND C40-1279, OR EQUIVALENT
3. INJECT SEALANT THROUGH HOLE IN MOUNTING RING

M1-0101-28-233

R Fuel Level Sight Gage - Removal and Installation
R Figure 402 (Sheet 2)

FUEL QUANTITY SIGNAL CONDITIONER, TANKS NO. 1 AND 3 REMOVAL AND INSTALLATION

1. Referenced Procedure

24-00-00 Electrical Power System - Maintenance Practices

24-41-00 Fuel Quantity Indicating System - Adjustment and Test

2. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers (FE/SO) aft circuit breaker panel CB3, zone 215, open and tag circuit breakers FUEL QTY IND - TEST, 1, and 3 (T1, T2, and T5).

(2) In mid-electrical service center, zone 137, disconnect electrical connector from signal conditioner receptacle (Ref. Fig. 401).

(3) Remove signal conditioner attach screws and remove conditioner.

B. Installation

(1) Verify that circuit breakers opened in Step 2A(1) are open and tagged.

(2) Hold signal conditioner in installed position and install attach screws.

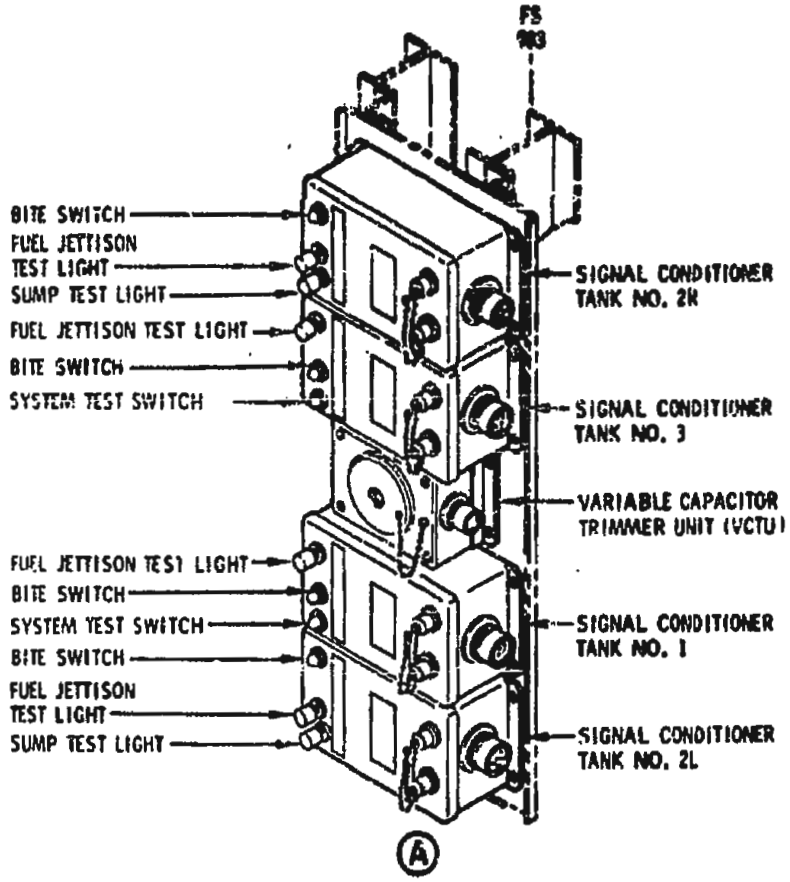
CR (3) Install electrical connector to signal conditioner
CR receptacle and tighten finger-tight.

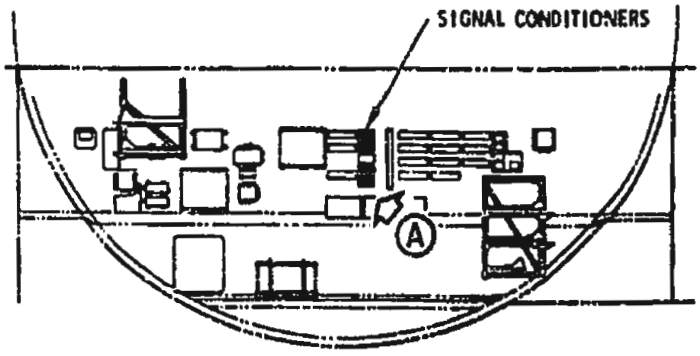
(4) Remove tags and close circuit breakers opened in Step 2A(1).

WARNING: ON FE/SO FUEL JETTISON PANEL VERIFY MASTER SWITCHLIGHT IS RELEASED, OPEN LIGHT, AND LEFT AND RIGHT BLUE VALVE IN-TRANSIT LIGHTS ARE OUT.

(5) Turn on electrical power (Ref. 24-00-00).

(6) Perform tank 1/3 system BITE check (Ref. 28-41-00, Adjustment and Test).





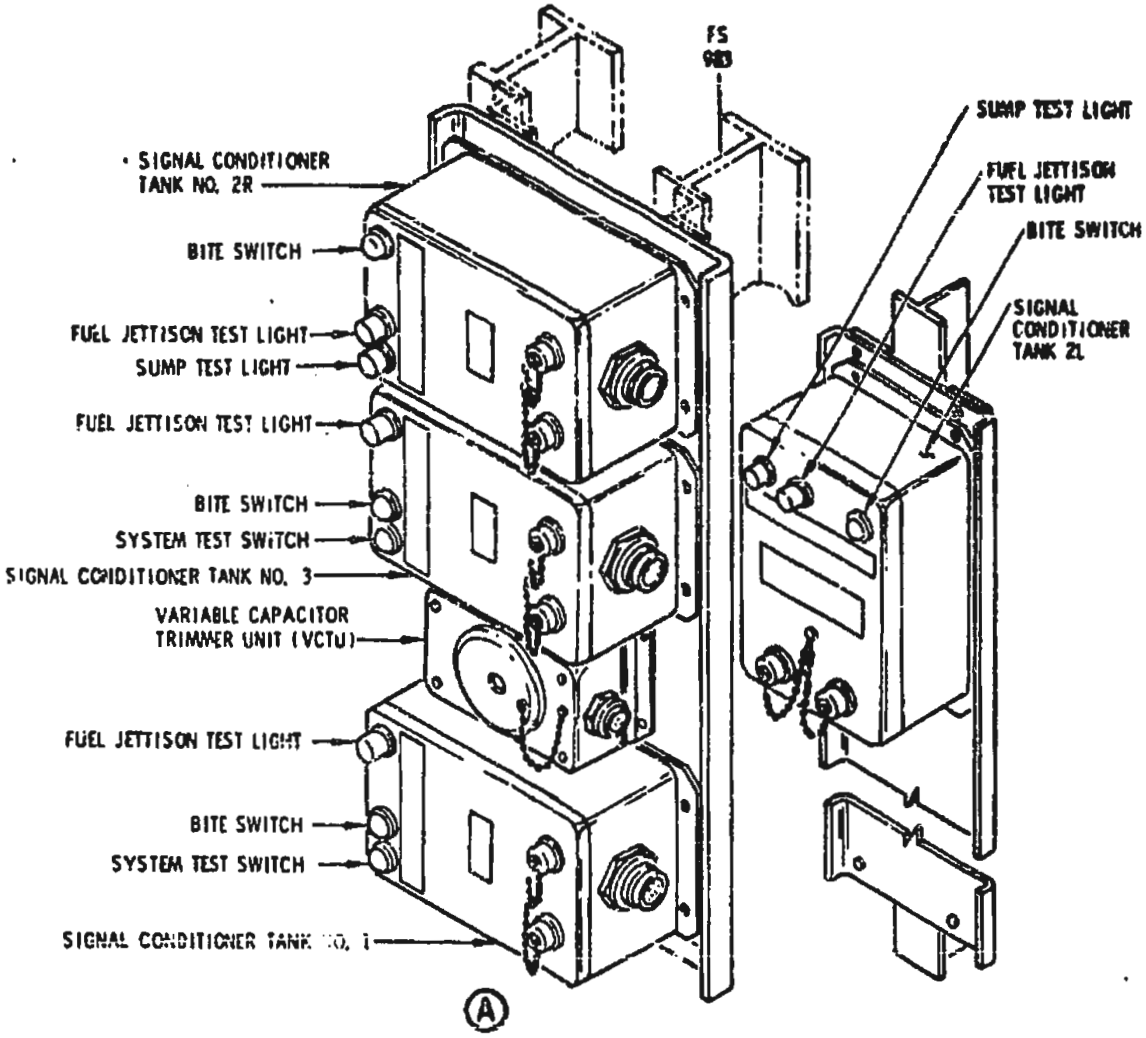
MID ELECTRICAL SERVICE CENTER
AFT BULKHEAD

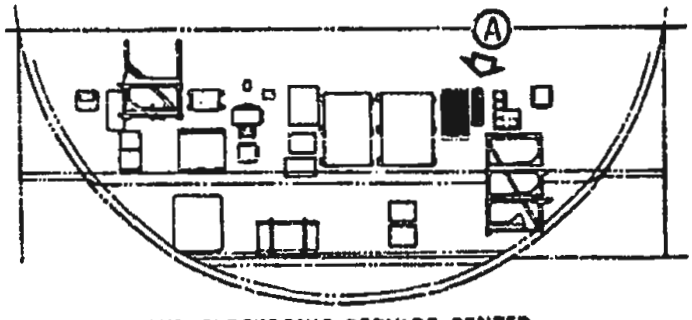
HH 8546
M1-1500-28-130

R Tank 1 and 3 Fuel Quantity Signal Conditioner
R Removal and Installation
R Figure 401

EFFECTIVITY: 001-023

001B





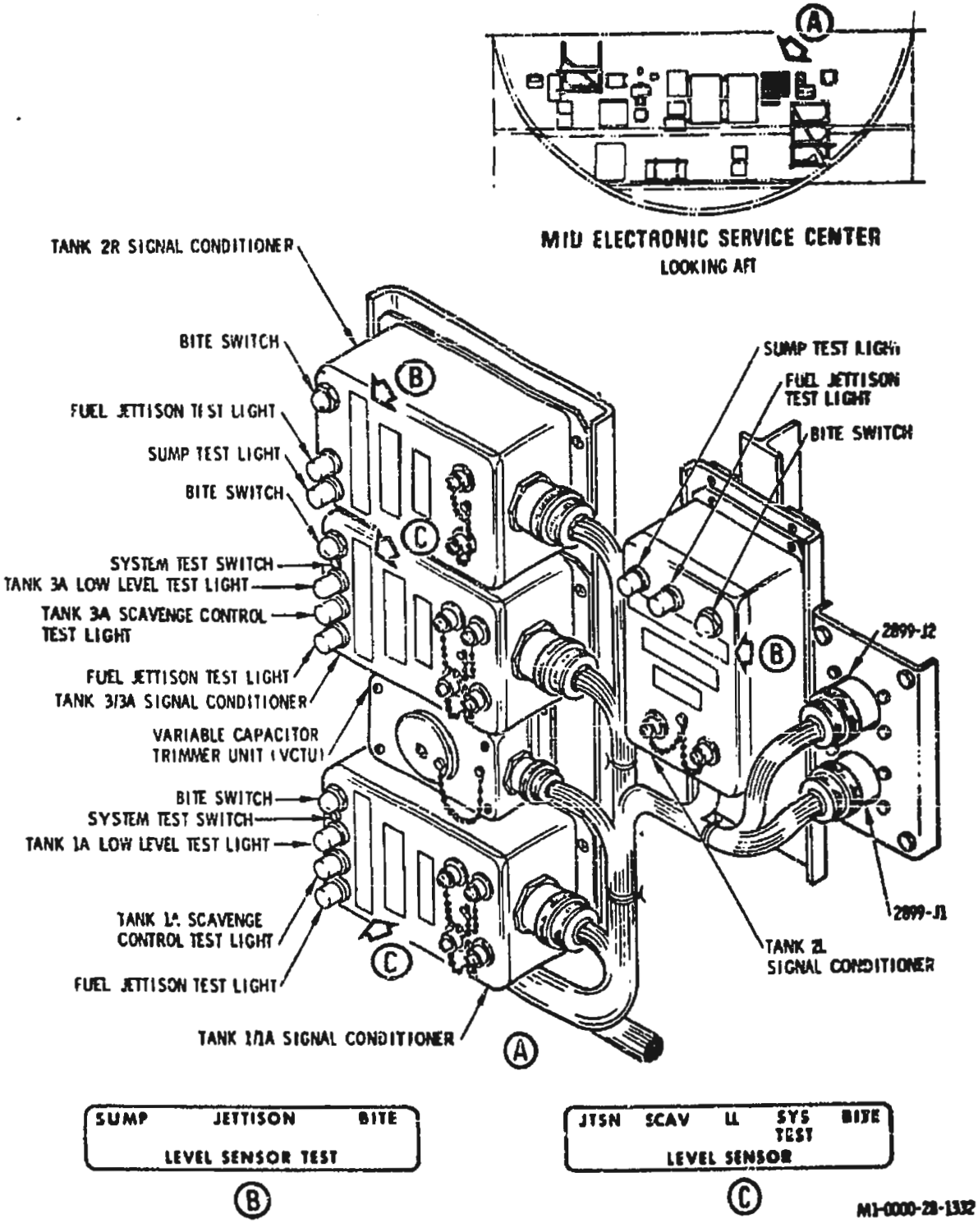
MID ELECTRONIC SERVICE CENTER
LOOKING AFT

M1-37500-28-378

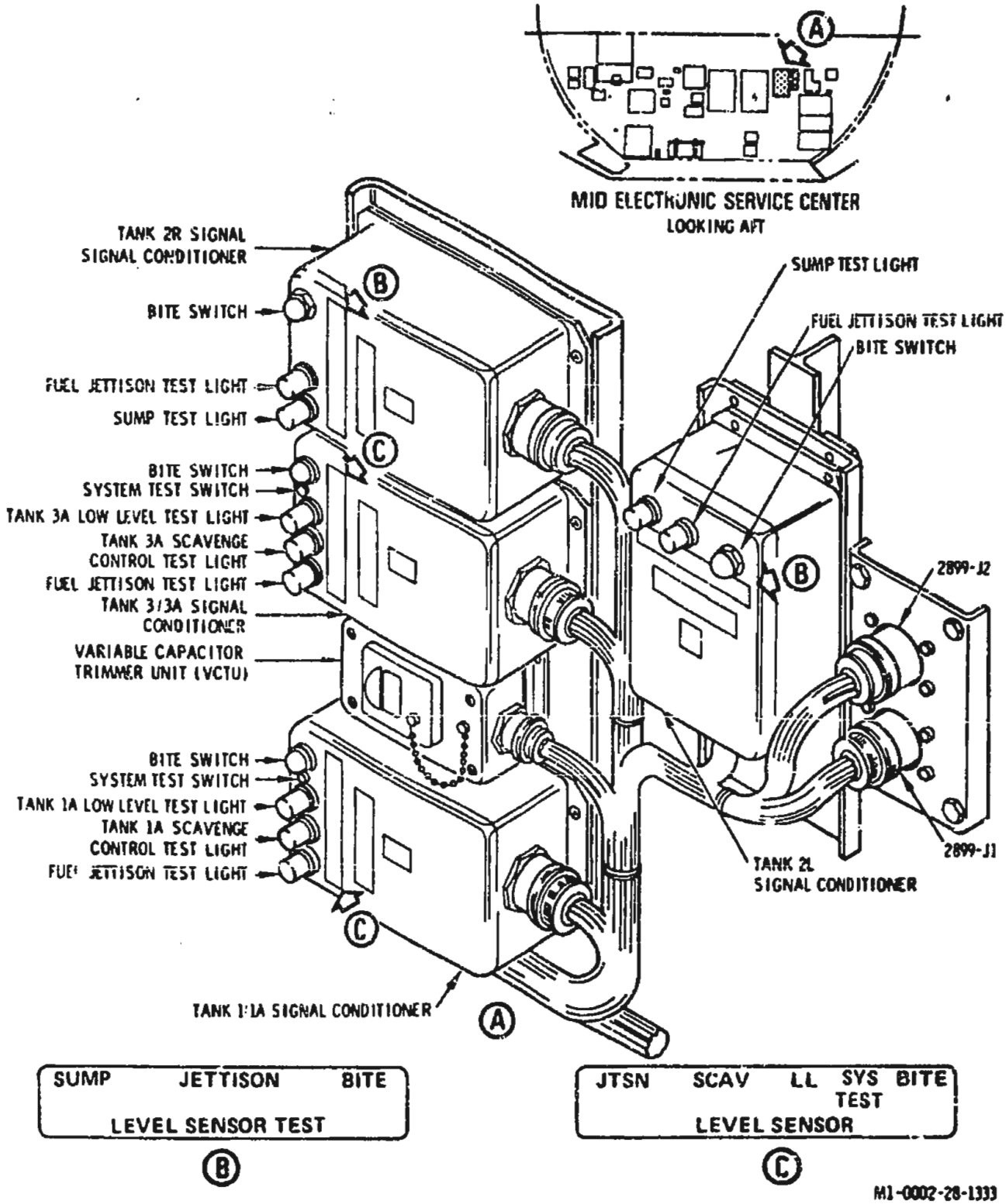
R
R
R Tank 1 and 3 Fuel Quantity Signal Conditioner
Removal and Installation
Figure 401

EFFECTIVITY: 024 AND 027

001B



Tank 1 and 3 Fuel Quantity Signal Conditioner
Removal and Installation
Figure 401



Tank 1 and 3 Fuel Quantity Signal Conditioner
Removal and Installation
Figure 401

(7) Turn off electrical power (Ref. 24-00-00).

FUEL QUANTITY SIGNAL CONDITIONER, TANKS NO. 2L and 2R REMOVAL AND INSTALLATION

1. Referenced Procedure

24-00-00	Electrical Power System - Maintenance Practices
24-41-00	Fuel Quantity Indicating System - Adjustment and Test

2. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers (FE/SO) aft circuit breaker panel CB3, zone 215, open and tag circuit breakers FUEL QTY IND - TEST, 2L, and 2R (T1,T3,T4). Verify that REFUEL POWER light on FUEL SYSTEM panel is out. If not, depress switchlight to put out light.

(2) In mid electrical service center, zone 137, disconnect electrical connector from signal conditioner receptacle (Ref. Fig. 401).

(3) Remove signal conditioner attach screws and remove conditioner.

B. Installation

(1) Verify that circuit breakers opened in Step 2A(1) are open and tagged.

(2) Hold signal conditioner in installed position and install attach screws.

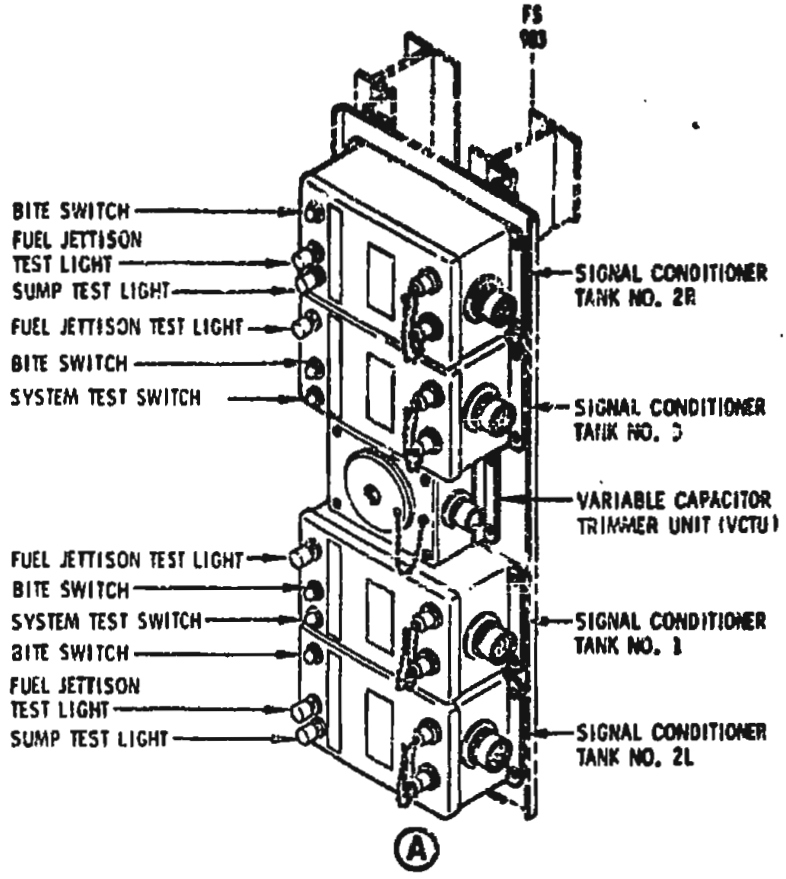
CR CR (3) Connect electrical harness plug to signal conditioner receptacle and tighten finger-tight.

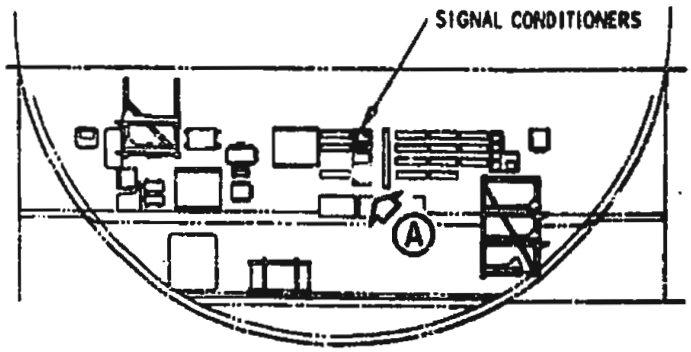
(4) Remove tags and close circuit breakers opened in Step 2A(1).

WARNING: ON FE/SO FUEL JETTISON PANEL VERIFY MASTER SWITCHLIGHT IS RELEASED, OPEN LIGHT, AND LEFT AND RIGHT BLUE DISAGREEMENT LIGHTS ARE OFF.

(5) Turn on electrical power (Ref. 24-00-00).

(6) Perform tank 2L/2R system BITE test (Ref. 28-41-00 Adjustment and Test).

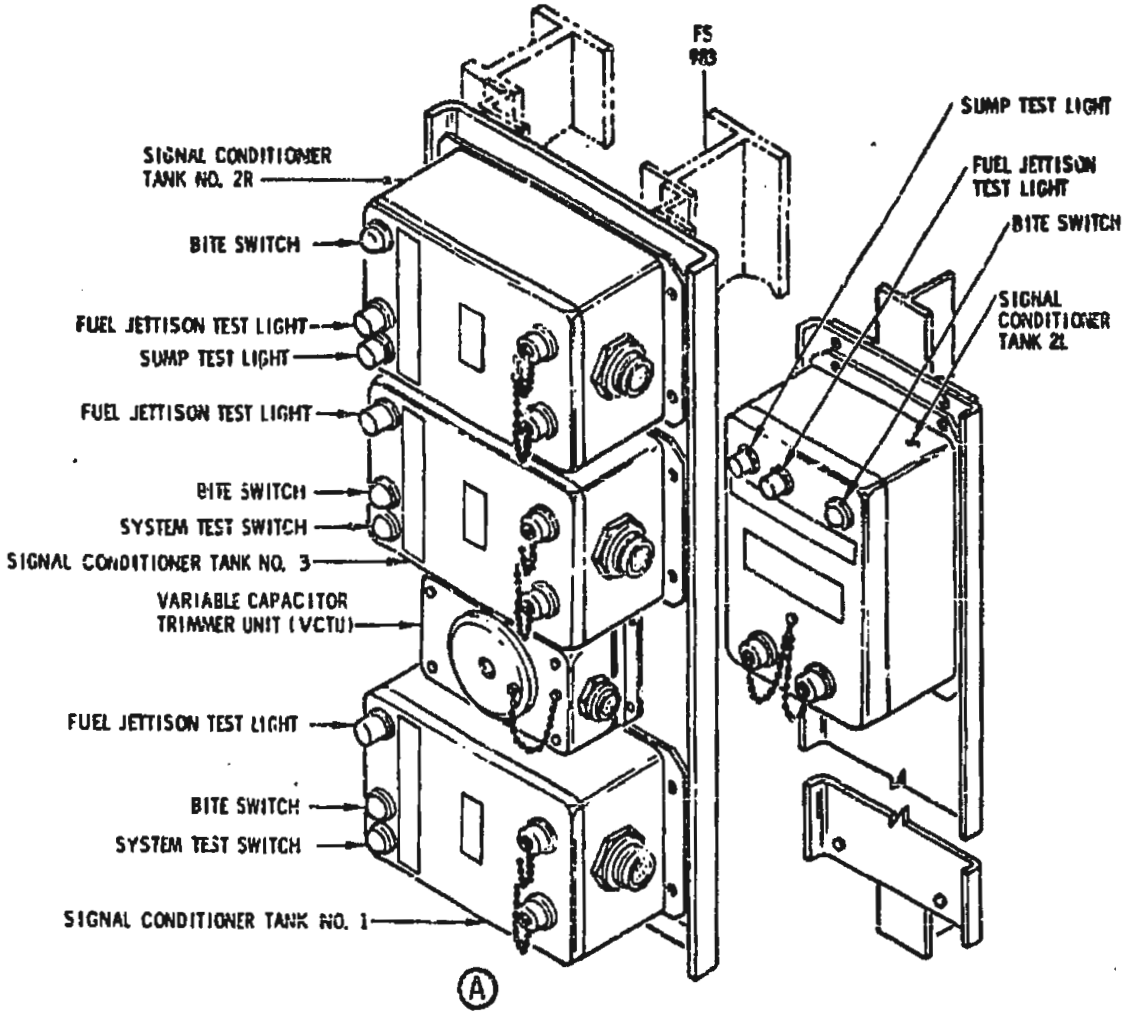


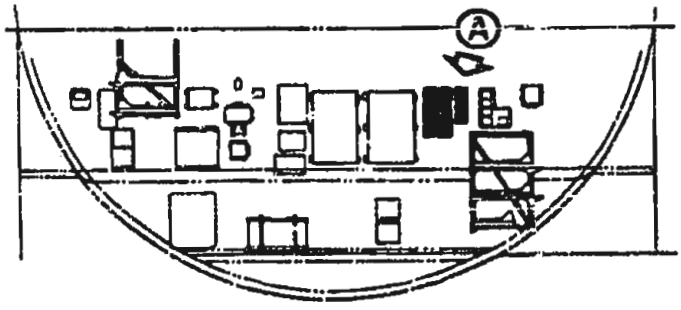


MID ELECTRICAL SERVICE CENTER
AFT BULKHEAD

HH 8546
M1-1300-28-150

Tank 2L/2R Fuel Quantity Signal Conditioner
Removal and Installation
Figure 401



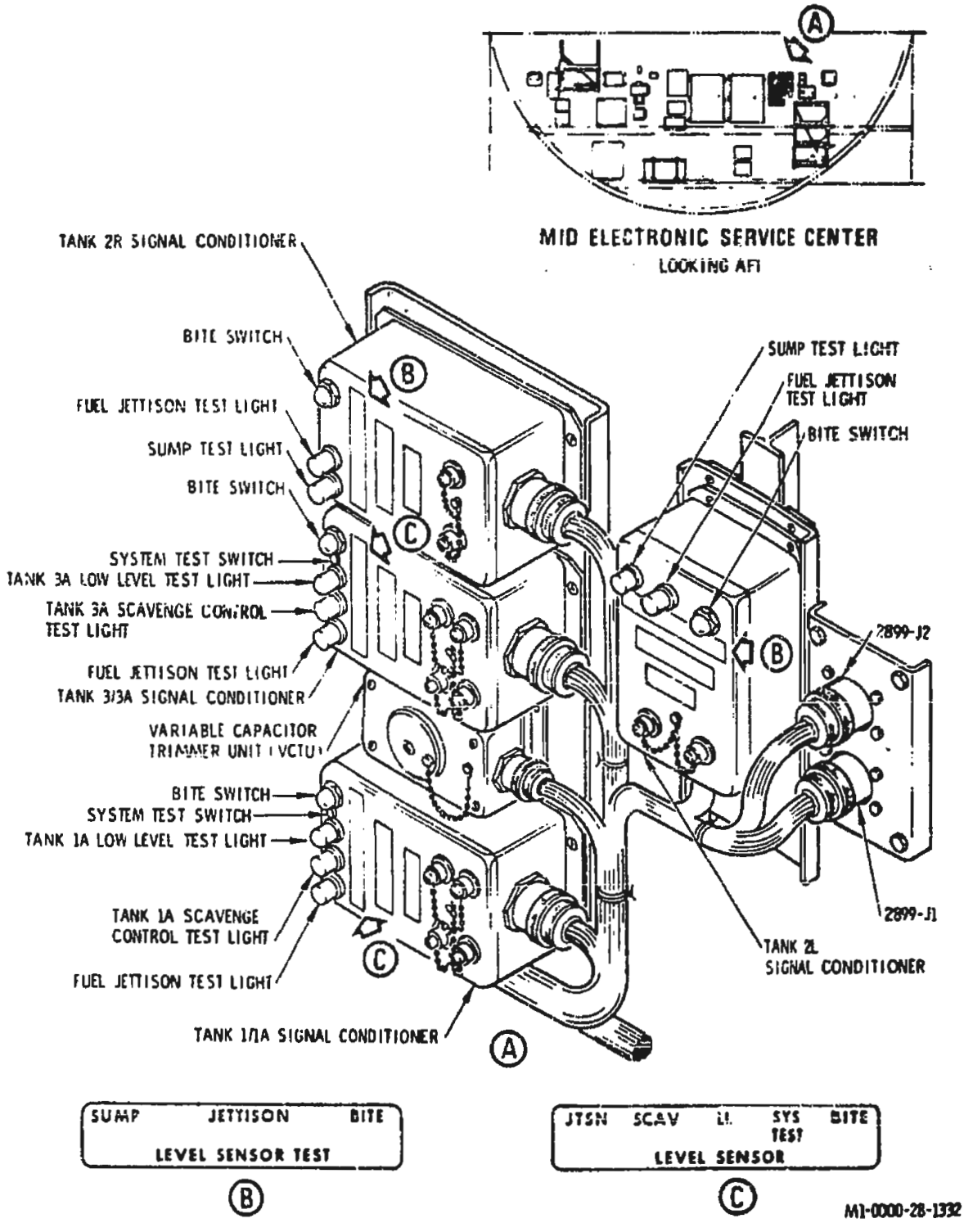


MID ELECTRONIC SERVICE CENTER
LOOKING AFT

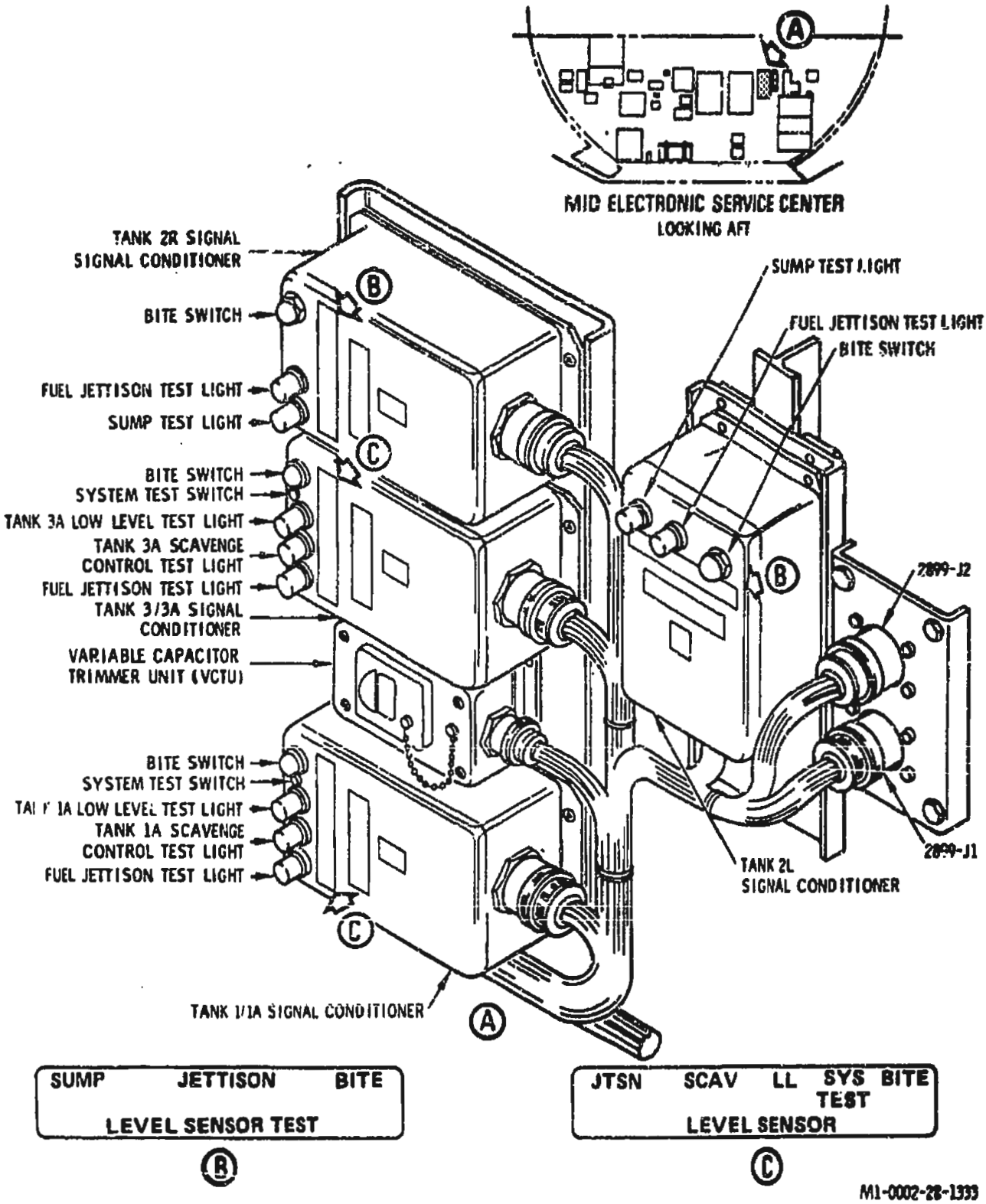
M1-31500-28-378

R Tank 2L/2R Fuel Quantity Signal Conditioner
R Removal and Installation
R Figure 401

EFFECTIVITY: 024 AND 027



Tank 2L/2R Fuel Quantity Signal Conditioner
Removal and Installation
Figure 401



Tank 2L and 2R Fuel Quantity Signal Conditioner
Removal and Installation
Figure 401

(7) Turn off electrical power (Ref. 24-00-00).

TANK 1A/3A FUEL QUANTITY TRANSMITTER PROBES REMOVAL AND INSTALLATION

1. General

Tank 1A/3A fuel quantity transmitter probes No. 16 and 17 are located in the interior of wing center tanks 1A and 3A. Probe No. 16 is equipped with a fuel low-level thermistor.

2. Equipment and Materials

MS3367-3-9 Strap

3. Referenced Procedures

	6-50-00	Interior Access Doors and Removable Panels - Description and Operation
	12-11-02	Fuel System - Servicing
R R	WM 20-11-16	L-1011 Fuel Tank Harness Repair, Splicing, and Retermination Data
	28-11-00	Fuel Tanks - Maintenance Practices
	28-22-00	Defueling - Maintenance Practices
	28-41-00	Fuel Quantity Indicating System - Adjustment and Test

4. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag circuit breakers FUEL QTY IND - TEST, 1, 2L, 2R, and 3 (T1 through T5).

(2) Defuel applicable fuselage fuel tank 1A or 3A (Ref. 28-22-00).

(3) Open access doors 142DB, and 147AB for access to the wing center section lower surface and hydraulic service center (Ref. 6-50-00).

(4) Remove access panels 141AZ and 147AZ for access to tanks 1A/3A (Ref. 6-50-00).

WARNING: PURGING OF FUEL TANK IS REQUIRED WHEN PERSONNEL MUST ENTER TANK. OBSERVE TANK ENTRY PRECAUTIONS (REF. 28-11-00).

(5) Remove access panels 141.3AZ and 141.7AZ for tank 1A (141.4AZ and 141.8AZ for tank 3A) and purge tank (Ref. 28-11-00).

(6) Disconnect electrical wiring from probe terminals (Ref. Fig. 401) and loosen wiring strain relief clamp screws. If probe No. 16 is being removed, cut tie-straps (3 places) to separate wiring from probe (Ref. WM 20-11-16).

(7) Remove probe attach screws and separate probe from support brackets at top and bottom of tank.

B. Installation

(1) Verify that circuit breakers opened in Step 4A(1) are open and tagged.

(2) Hold probe in installed position with electrical terminals at the top (Ref. Fig. 401) and install attach screws at upper and lower support brackets. Probe No. 16 is installed with thermistor at lower end of probe.

(3) Connect wiring to probe using captive screws on wiring terminals. Engage wiring to strain relief clamps and tighten clamp screws. On probe No. 16 attach thermistor wires to probe with tie-straps at locations indicated on Figure 401 (Ref. WM 20-11-16).

(4) Remove tags and close circuit breakers opened in Step 4A(1).

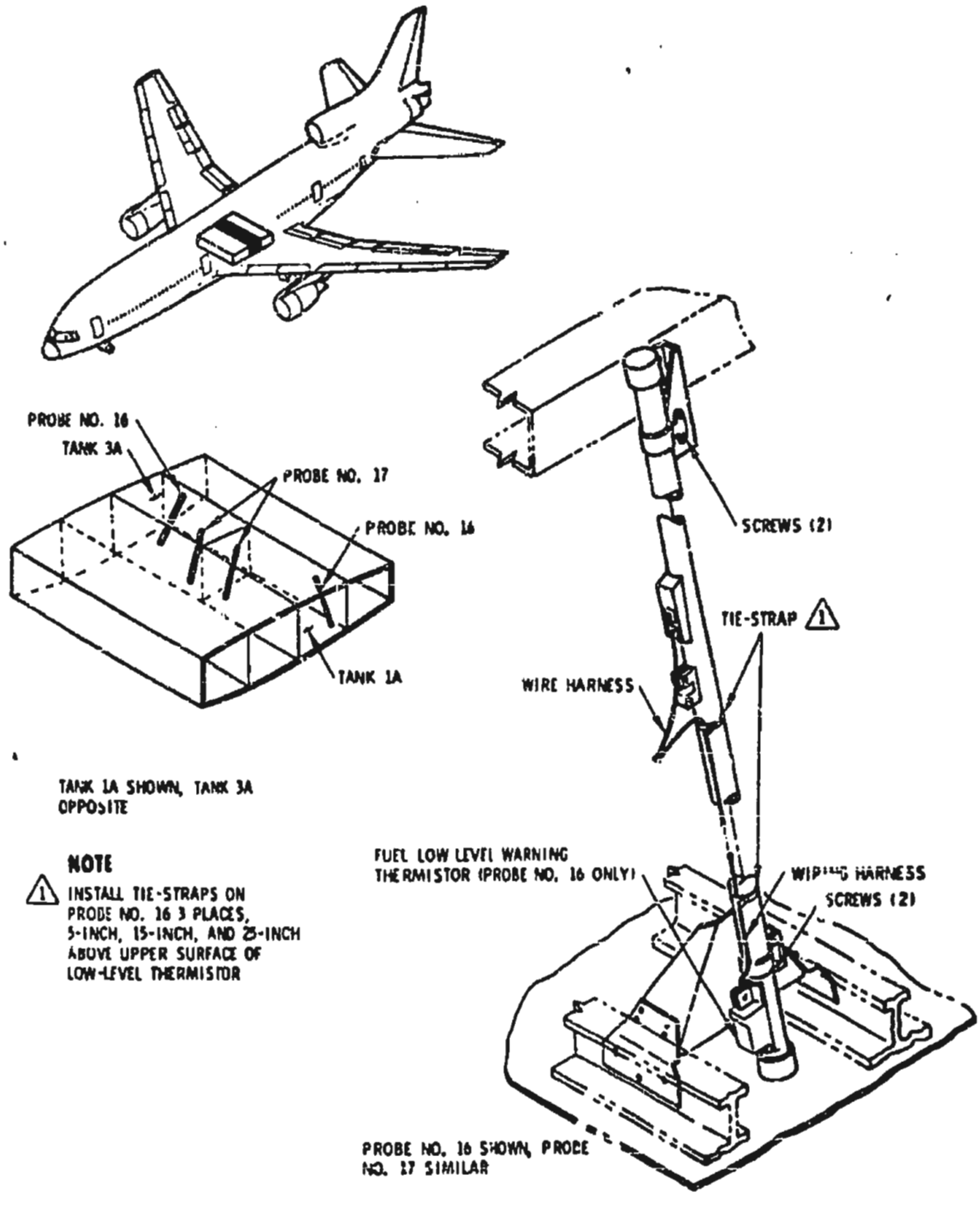
(5) Turn on electrical power (Ref. 24-00-00).

(6) In MESC, check and, if necessary trim applicable tank 1/1A or 3/3A total probe and harness capacitance (Ref. 28-41-00 Adjustment and Test).

NOTE: VCTU trimmer capacitor adjustment may be postponed until fourth probe in the affected tank probe and harness installation is replaced.

(7) Remove tank ventilation ducting and reinstall access panels removed in Step 4A(4) and (5).

(8) Fuel tank as necessary (Ref. 12-11-00). Check for leaks around access panels.


PROBE NO. 16
TANK 3A
PROBE NO. 17
PROBE NO. 16
TANK 1A
TANK 1A SHOWN, TANK 3A OPPOSITE
NOTE
1 INSTALL TIE-STRAPS ON PROBE NO. 16 3 PLACES, 5-INCH, 15-INCH, AND 25-INCH ABOVE UPPER SURFACE OF LOW-LEVEL THERMISTOR
SCREWS (2)
TIE-STRAP 1
WIRE HARNESS
FUEL LOW LEVEL WARNING THERMISTOR (PROBE NO. 16 ONLY)
WIRING HARNESS
SCREWS (2)
PROBE NO. 16 SHOWN, PROBE NO. 17 SIMILAR
M -74001-28-1099

Fuel Quantity Tank Probe - Removal and Installation
Figure 401

CAUTION: VERIFY THAT ZIPPER DOOR IN AIRFLOW BARRIER BELOW WING CENTER SECTION IS CLOSED.

(9) Close access doors opened in Step 4A(3).

TANK 1A/3A FUEL LEVEL SIGHT GAGE - REMOVAL AND INSTALLATION

1. Equipment and Materials

Installation Tool APCO 727793TA, or equivalent

Adhesive, Poxy-Hesive No. 1191 (Permalite Plastic Co., Costa Mesa, Calif.), or equivalent

Preformed Packing (Ref. Fig. 401)

Grease, Fluorosilicone, Dow Corning FS-1291, or equivalent

Lock-wire - Fed Spec QQ-W-390, 0.032-inch diameter

2. Referenced Procedures

6-50-00	Interior Access Doors and Removable Panels - Description and Operation
12-11-00	Servicing - Maintenance Practices
28-11-00	Fuel Tanks - Maintenance Practices
28-22-00	Defueling - Maintenance Practices

3. Removal and Installation (Lower Calibrated Stick)

A. Removal

(1) Push up slightly on sight gage stick and rotate it 90 degrees counterclockwise to its unlocked position. Release stick. Internal spring will cause stick to project approximately one inch below the fuselage fairing.

(2) Pull stick downward until ball and socket connection to upper stick is exposed (Ref. Fig. 401).

NOTE: If stick is broken, this may require lowering of the tank fuel level until the broken portion of the stick projects from the housing (Ref. 28-27-00) or disengagement of the housing extension from the upper stick housing mounting base.

(3) Separate lower stick from upper stick by disengaging ball joint.

B. Installation

(1) Firmly grasp upper stick and snap ball joint into bayonet head on lower stick (Ref. Fig. 401).

(2) Raise and lower stick to check for binding.

If tank contains fuel, verify that stick magnetically latches to float and seeks position dictated by float without binding.

(3) Install new felt wiper at lower end of stick if condition warrants replacement.

(4) Fully retract stick assembly and, using slot screwdriver, depress and rotate stick 90 degrees clockwise to engage bayonet lock.

4. Removal/Installation (Upper Calibrated Stick)

A. Removal

(1) Remove lower calibrated stick [Ref. Step 3A(1)].

(2) Back off housing extension connector nut (Ref. Fig. 401).

(3) Disengage housing extension from upper housing assembly mounting base and lower housing downward into keelson area.

(4) Push upper stick into upper housing.

(5) Using APC0727793TA, or equivalent tool, remove bayonet socket, spring retainer, and spring.

(6) Gently pull on extended stick to dislodge the stick guide. Remove stick and guide.

B. Installation

NOTE: Before installing stick, check removed parts for general condition. Inspect sticks for legibility of calibration marks, distortion, and condition of teflon bearings on armature at upper end of upper stick. Replace spring if distorted. Free length of spring must be 0.98 to 1.04 inches. When compressed to 0.375 inches, spring force must be 4.75 to 5.25 pounds. Replace lower stick or bayonet socket if locking lugs on head or cam lock surfaces in socket are distorted, worn, or damaged.

(1) Lubricate preformed packing with fluorosilicone grease and install on bayonet socket (Ref. Fig. 401).

(2) Install guide on new stick and insert into upper housing.

(3) Insert spring, spring retainer, and bayonet socket into upper housing mounting base (in order listed).

(4) Raise stick and assembled parts into housing.

(5) Using installation tool, tighten socket.

(6) Insert lower stick through housing extension and engage ball joint connection to upper stick.

(7) Raise housing extension and engage WIG-O-FLEX connector to upper housing mounting base.

5. Removal/Installation (Housing Extension)

A. Removal

(1) Remove lower stick (Ref. Step 3A).

(2) Enter keelson area through door 142DB and locate tank 1A or 3A lower tube assembly (Ref. Fig. 401).

(3) Disconnect WIG-O-FLEX connector nut.

(4) Remove split washers, preformed packing, and connector nut (17).

(5) Lower housing extension through keelson to second man below fuselage.

B. Installation

(1) Enter keelson area through access door 142DB.

(2) Insert housing extension through fuselage fairing to assistant in keelson area (Ref. Fig. 401).

(3) Install connector nut, split washer, lightly greased O-ring (16), and second split washer (in order listed).

(4) Attach WIG-O-FLEX connector nut to upper housing mounting base and install lock-wire.

(5) Install lower stick (Ref. 3B).

6. Removal/Installation (Housing)

A. Removal

NOTE: The sight gage housing may be replaced on the aircraft, without disturbing the sealed mounting base, if required due to a damaged housing or faulty housing seals. (Fuel seepage around the mounting base, however, can be corrected only by resealing or replacement of the sight gage mounting base.)

(1) Defuel applicable 1A or 3A tank (Ref. 28-22-00).

(2) Remove lower and upper calibrated sticks (Ref. 3A and 3B).

(3) Enter keelson area through lower fuselage access door 142DB (Ref. 6-50-00).

(4) Remove housing extension (Ref. 3C).

(5) Enter center section dry bay area through access hole 141AZ.

(6) Remove applicable tank 1A or 3A access panel 141.3AZ or 141.4AZ.

CAUTION: OBSERVE TANK ENTRY SAFETY RULES AND PRECAUTIONS (REf. 28-11-00). ALWAYS WEAR APPROVED RESPIRATOR WHEN ENTERING FUEL TANK AREAS.

(7) Using 9/16-inch hex stock and wrench, unscrew upper stick housing out of mounting base and allow housing to extend into the keelson (Ref. Fig. 401).

(8) Enter tank and, using a suitable tool, remove the dab of adhesive at both ends of the upper float stop retaining pin.

NOTE: Removal of upper float stop will allow housing to drop out of the sight gage mounting base. Have assistant standing by below the wing center section fuselage to hold the housing.

(9) Carefully drive out the float stop retaining pin. Remove float stop and float.

(10) Remove housing assembly through hole in fuselage fairing.

B. Installation

(1) Lightly lubricate two new O-rings with flurosilicone grease and install on housing (Ref. Fig. 401).

(2) Insert housing through hole in wing center section and into mounting base.

(3) Install float and float stop. Verify that float moves freely throughout length of housing.

(4) Secure float stop to housing using new retaining pin. Apply a dab of Poxy-Hesive (or equivalent adhesive) to both ends of pin.

(5) While assistant in tank directs housing into cup-shaped guide at top of tank screw housing into mounting base, using 9/16-inch hex stock. Tighten housing until it is snugly seated.

(6) Reinstall housing extension, and the calibrated stick assemblies.

(7) Reinstall tank access covers removed in Step 5A(6) and refuel tank, with calibrated stick extended (Ref. 12-11-00).

(8) Verify that calibrated stick retracts with rising fuel level. Check for fuel seepage at bayonet socket.

(9) Insert stick and rotate head (21) clockwise 90 degrees to fully locked position.

7. Removal/Installation (Tank Sight Gage Assembly)

A. Removal

(1) Defuel fuselage fuel tank 1A or 3A (Ref. 28-22-00).

(2) Remove calibrated stick, and housing extension (Ref. Fig. 401).

(3) Remove mounting base jamnut and keyed lock washer.

(4) Using phenolic or plastic tool, remove fillet sealant around mounting base flange.

(5) Raise mounting base to clear tank floor and tilt assembly to disengage it from cup-shaped guide at top of tank.

B. Installation

(1) Remove lower calibrated stick and housing extension from sight gage assembly, if installed (Ref. Fig. 401).

(2) In tank, remove all sealant residue from around sight gage mounting hole.

(3) Install greased O-ring (5) in slot in sight gage base (4).

(4) Install new preformed packing in mounting base groove.

(5) Insert upper housing into cup-shaped guide at top of tank.

(6) Insert sight mounting base through hole in tank lower surface.

(7) Hold sight gage base while second man, below tank, installs anti-rotation washer and jamnut. Tighten jamnut 120 to 140 lb-inch.

(8) Lock-wire jamnut to keyed lock-washer.

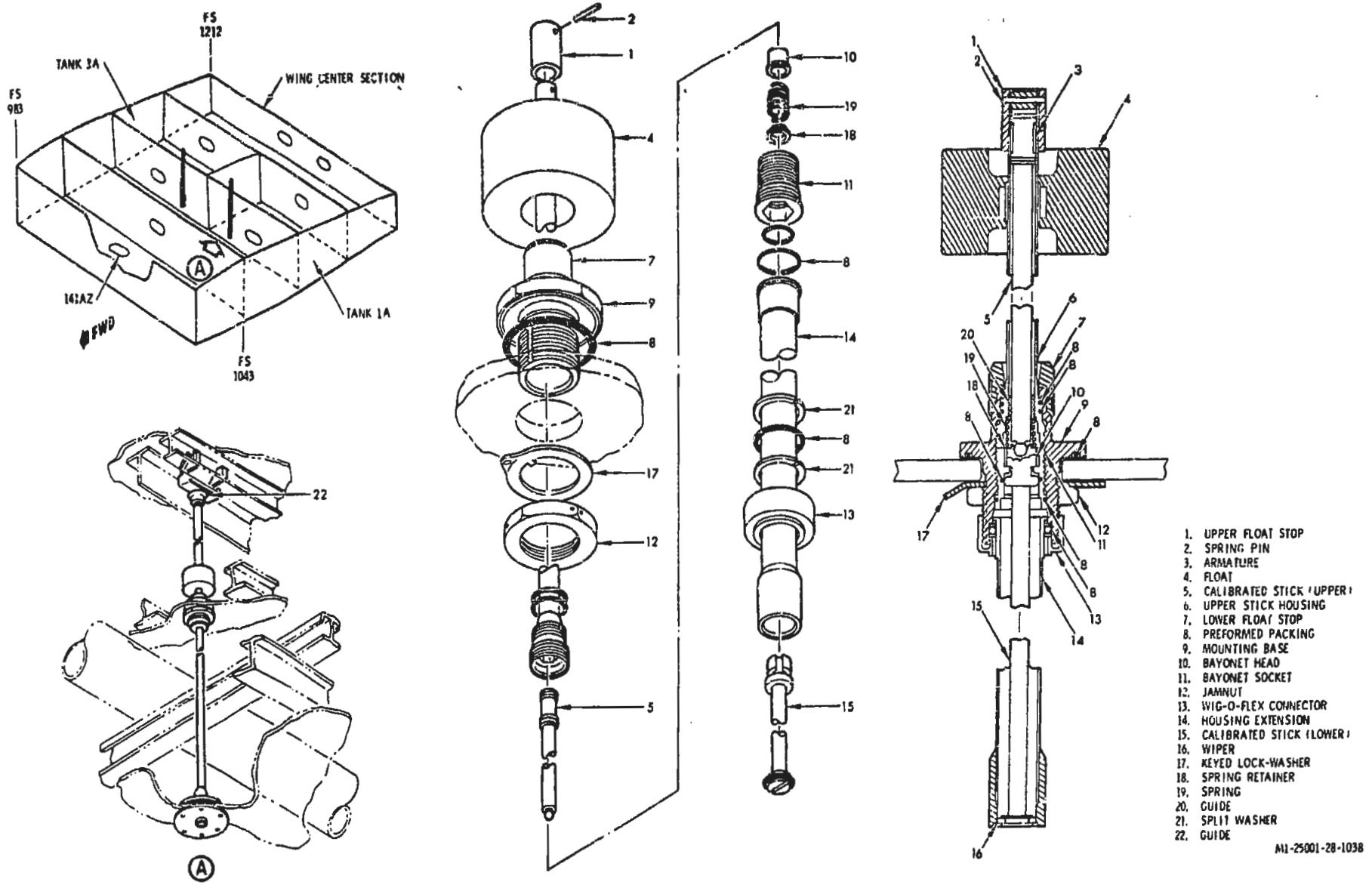
R R (9) Apply fillet sealant around mounting base (Ref. 28-11-00, Para. 7).

(10) Reinstall housing extension and calibrated sticks.

(11) Reinstall tank access covers removed in Step 5A(6).

(12) Refuel tank and check sight gage installation for leaks.

(13) Check calibrated stick for free movement to its fully extended position and for positive magnetic coupling with float.



1. UPPER FLOAT STOP
2. SPRING PIN
3. ARMATURE
4. FLOAT
5. CALIBRATED STICK (UPPER)
6. UPPER STICK HOUSING
7. LOWER FLOAT STOP
8. PREFORMED PACKING
9. MOUNTING BASE
10. BAYONET HEAD
11. BAYONET SOCKET
12. JAMNUT
13. WIG-O-FLEX CONNECTOR
14. HOUSING EXTENSION
15. CALIBRATED STICK (LOWER)
16. WIPER
17. KEYED LOCK-WASHER
18. SPRING RETAINER
19. SPRING
20. GUIDE
21. SPLIT WASHER
22. GUIDE

M1-25001-28-1038

Fuel Level Sight Gage - Removal and Installation
Figure 401

R
R
0018 EFFECTIVITY: 025-026, 028-999

EMERGENCY AND CROSSFEED INDICATING SYSTEM DESCRIPTION AND OPERATION

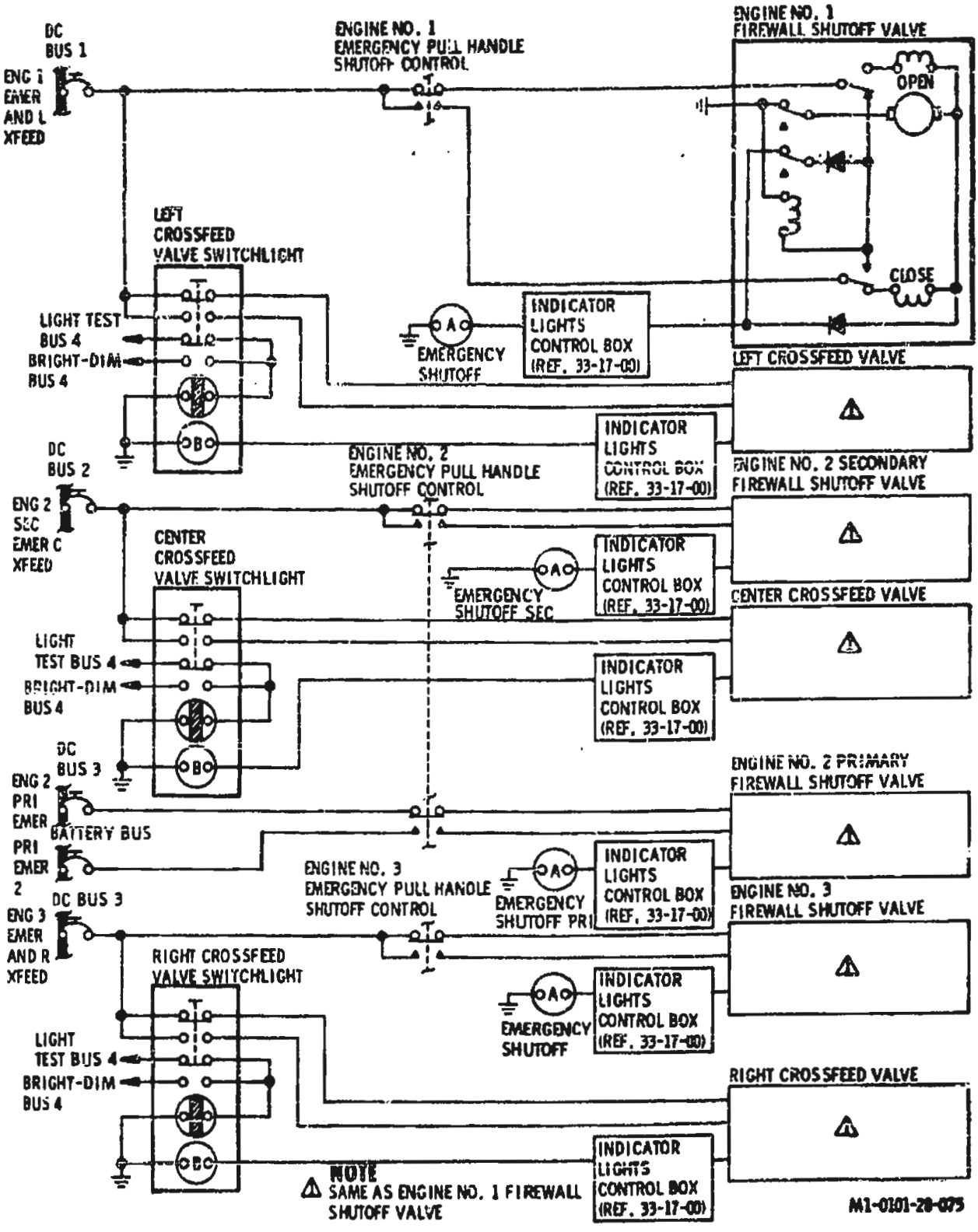
1. General

The fuel emergency indication system (Ref. Fig. 1) monitors the position of the firewall shutoff valves and tank isolation valves. There is one fuel firewall shutoff valve for engines No. 1 and No. 3 and two valves for engine No. 2. Valves for the No. 1 and 3 engines are located in the engine pylons. Valves for the No. 2 engine are located in the aft fuselage section at FS 2011.9 (Ref. 28-24-00). Tank isolation valves are located on the wing front beam and in the hydraulic service center. The appropriate firewall shutoff valve and tank isolation valve will close when the FIRE PULL handle is actuated. These handles, one for each engine, are located in the pilots overhead panel. When a FIRE PULL handle is actuated, an EMERGENCY SHUTOFF light on the fuel system panel will stay on until the firewall shutoff valve and tank isolation valve changes position. The light then will go out.

The fuel system crossfeed valves are powered from the same circuit breaker as the respective firewall shutoff valves. Actuation of the firewall shutoff valves will not affect operation of the crossfeed valves (Ref. Fig. 1).

Depressing the crossfeed valve switchlight located on the Flight Engineer/Second Officers FUEL SYSTEM control panel will cause the crossfeed valve light to come on. The light will go out when the valve selected position is attained.

R The tank isolation valves and crossfeed valves are similar and can be interchanged, if necessary. The No. 1 and No. 3 engine firewall shutoff valves are interchangeable. The No. 2 engine firewall shutoff valves have a different valve body, but the valve electrical motor actuators are similar to the No. 1 and No. 3 engine shutoff valves.


DC BUS 1
ENG 1 EMER AND L XFEED
ENGINE NO. 1 EMERGENCY PULL HANDLE SHUTOFF CONTROL
ENGINE NO. 1 FIREWALL SHUTOFF VALVE
OPEN
CLOSE
LEFT CROSSFEED VALVE SWITCHLIGHT
LIGHT TEST BUS 4
BRIGHT-DIM BUS 4
EMERGENCY SHUTOFF
INDICATOR LIGHTS CONTROL BOX (REF. 33-17-00)
LEFT CROSSFEED VALVE
DC BUS 2
ENG 2 SEC EMER C XFEED
ENGINE NO. 2 EMERGENCY PULL HANDLE SHUTOFF CONTROL
ENGINE NO. 2 SECONDARY FIREWALL SHUTOFF VALVE
CENTER CROSSFEED VALVE SWITCHLIGHT
EMERGENCY SHUTOFF SEC
CENTER CROSSFEED VALVE
LIGHT TEST BUS 4
BRIGHT-DIM BUS 4
DC BUS 3
ENG 2 PRI EMER PRI EMER 2
BATTERY BUS
ENGINE NO. 2 PRIMARY FIREWALL SHUTOFF VALVE
ENGINE NO. 3 EMERGENCY PULL HANDLE SHUTOFF CONTROL
EMERGENCY SHUTOFF PRI
ENGINE NO. 3 FIREWALL SHUTOFF VALVE
DC BUS 3
ENG 3 EMER AND R XFEED
RIGHT CROSSFEED VALVE SWITCHLIGHT
EMERGENCY SHUTOFF
RIGHT CROSSFEED VALVE
LIGHT TEST BUS 4
BRIGHT-DIM BUS 4
NOTE
⚠ SAME AS ENGINE NO. 1 FIREWALL SHUTOFF VALVE
M1-0101-28-075

R Emergency and Crossfeed Indicating System Schematic
R Figure

EFFECTIVITY: ALL

FUEL PRESSURE INDICATING SYSTEM - DESCRIPTION AND OPERATION

1. General

Eight normally closed fuel pressure-actuated switch assemblies, one for each of the dual boost pump assembly pump and motor elements, provide a flight station warning light indication of low pump output pressure. Individual switch assemblies receive 28V dc from either INBD PUMP IND or OUTBD PUMP IND circuit breakers through the respective pump switchlights on the FUEL SYSTEM panel whenever these switchlights are depressed to operate the boost pumps. The switchlight LOW legend is
R illuminated until rising boost pump pressure opens the pressure-actuated switch. The LOW legend comes on again whenever boost pump pressure falls below 6 (+1) psi and the switch closes. The low fuel pressure indicating circuits are included in the fuel boost pump schematics in Section 28-24-00.

2. Boost Pump Low Pressure Switch

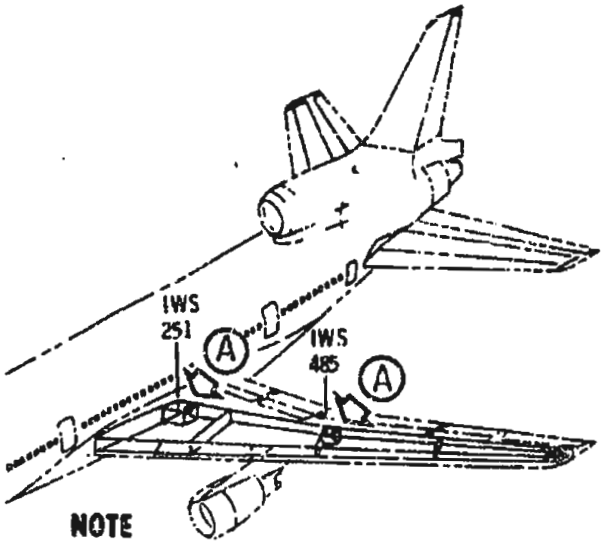
A. Description

The fuel boost pump low pressure switch assembly (Ref. Fig. 1) contains a diaphragm-operated normally closed microswitch, a spring-loaded switch-actuating pin, and an adjusting screw. A fuel inlet fitting and three potted pigtail leads are located at opposite ends of the switch assembly housing. The adjusting screw is threaded into the switch assembly housing and retained by a locking setscrew. The actuating spring seats bear against the adjusting screw and the stop actuator and diaphragm assembly. Spring tension determines the amount of fuel pressure required to move the pin and open the switch, and is set by rotating the adjusting screw. Access to the screw adjustment provisions is acquired by rotating the housing nameplate to expose the locking setscrew and a series of holes that enable use of a 1/8-inch diameter driftpin to rotate the screw. The switch assembly is installed by screwing the fuel inlet fitting into a mating fitting attached to the rear wing beam. A hex head surface on the fitting permits use of an open end wrench to remove and install the unit.

B. Operation

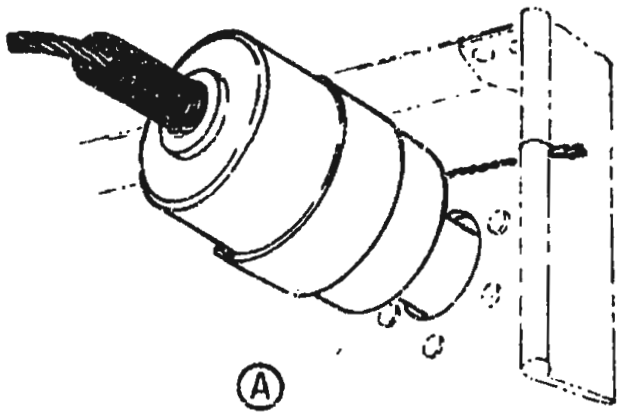
Fuel pressure acting against the diaphragm is opposed by the spring force applied to the stop actuator and acting against the opposite side of the diaphragm (Ref. Fig. 1). When fuel pressure is sufficient to overcome the spring force, the stop actuator and switch actuating pin move towards the

switch. The pin bearing against the switch button causes the switch to snap open. When fuel pressure drops below that required to overcome the spring force, the spring moves the stop actuator and pin away from the switch and the
CR switch closes.

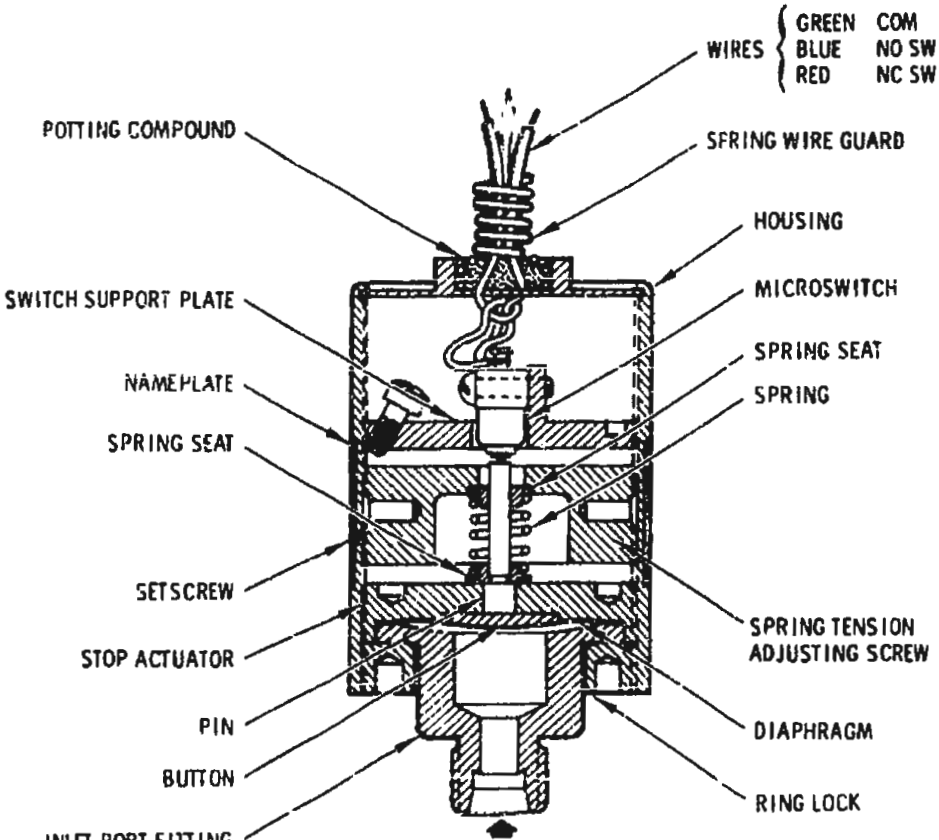


NOTE

SWITCHES IN RIGHT WING
ARE AT SAME WING STATION
REFERENCES AS SHOWN FOR LEFT WING



BOOST PUMP LOW
PRESSURE SWITCH
(TYPICAL INSTALLATION)



FUEL PRESSURE SWITCH
CROSS-SECTION VIEW

M1-0100-28-295

R
R

Boost Pump Low Fuel Pressure Switch
Figure 1

BOOST PUMP LOW PRESSURE SWITCH - REMOVAL AND INSTALLATION

1. General

Removal and installation procedures are identical for each of the eight fuel pressure switches.

2. Equipment and Materials

Preformed packing (Ref. Fig. 401)

Lock-wire, Fed Spec QQ-W-390, 0.032-inch diameter, or equivalent

Hand-held Container

3. Referenced Procedures

	6-40-00	Exterior Access Doors and Panels
R R	20-13-01	Wiring Diagram Manual - Matrix Terminal Junctions - Maintenance Practices
R R	20-19-02	Wiring Diagram Manual - Dead Ending of Shielded Wires and Cables - Maintenance Practices
	24-41-00	External Power/Ground Service System - Maintenance Practices

4. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag the following circuit breakers as applicable:

INBD PUMP IND (U1 or U2)

OUTBOARD BOOST PUMP 2L (U3 or U5)

OUTBOARD BOOST PUMP 2R (U4 or U6)

INBD BOOST PUMP - 1, 2L, 2R, 3 (U7 through U10)

OUTBD BOOST PUMP - 1 and 3 and IND (U13 through U15)

(2) Remove access panel 541AB, 541GB, 641AB, or 641GB, as applicable, (Ref. 6-40-00).

(3) Identify terminal module to which the red and green switch wires are wired. Remove wire terminal contacts
R from modules (Ref. WDM 20-13-01).

CAUTION: HAVE CONTAINER READY TO CATCH FUEL THAT WILL FLOW FROM THE FUEL LINE FITTING WHEN THE FUEL PRESSURE SWITCH IS REMOVED. BE READY TO IMMEDIATELY INSTALL THE REPLACEMENT SWITCH OR CAP THE FITTING WITH AN MS-TYPE PLUG.

(4) Unscrew fuel pressure switch from 1/4-inch fitting and remove.

(5) Cap opened fitting port with MS-type plug or immediately install new switch assembly.

B. Installation

(1) Verify that circuit breakers opened in Step 4A(1) are open and tagged.

(2) Install preformed packing on threaded end of fuel pressure switch assembly.

(3) Screw fuel pressure switch into the fuel line fitting, tighten switch assembly just enough to firmly seat it in the fitting. Safety switch to adjacent structure using 0.032-inch diameter lock-wire.

R (4) Cut and stow blue switch wire (Ref. WDM 20-19-02).

(5) Route red and green wires to terminal modules noted at time of removal. Install crimp terminals and insert
R wires into modules (Ref. WDM 20-13-01).

(6) Remove tags and close the following circuit breakers as applicable:

INBD PUMP IND (U1 or U2)

OUTBD BOOST PUMP IND (U15)

(7) Turn on electrical power (Ref. 24-41-00).

(8) On Flight Engineer/Second Officers FUEL SYSTEM panel, depress applicable TANK PUMP switchlight. Verify that LOW legend light comes on.

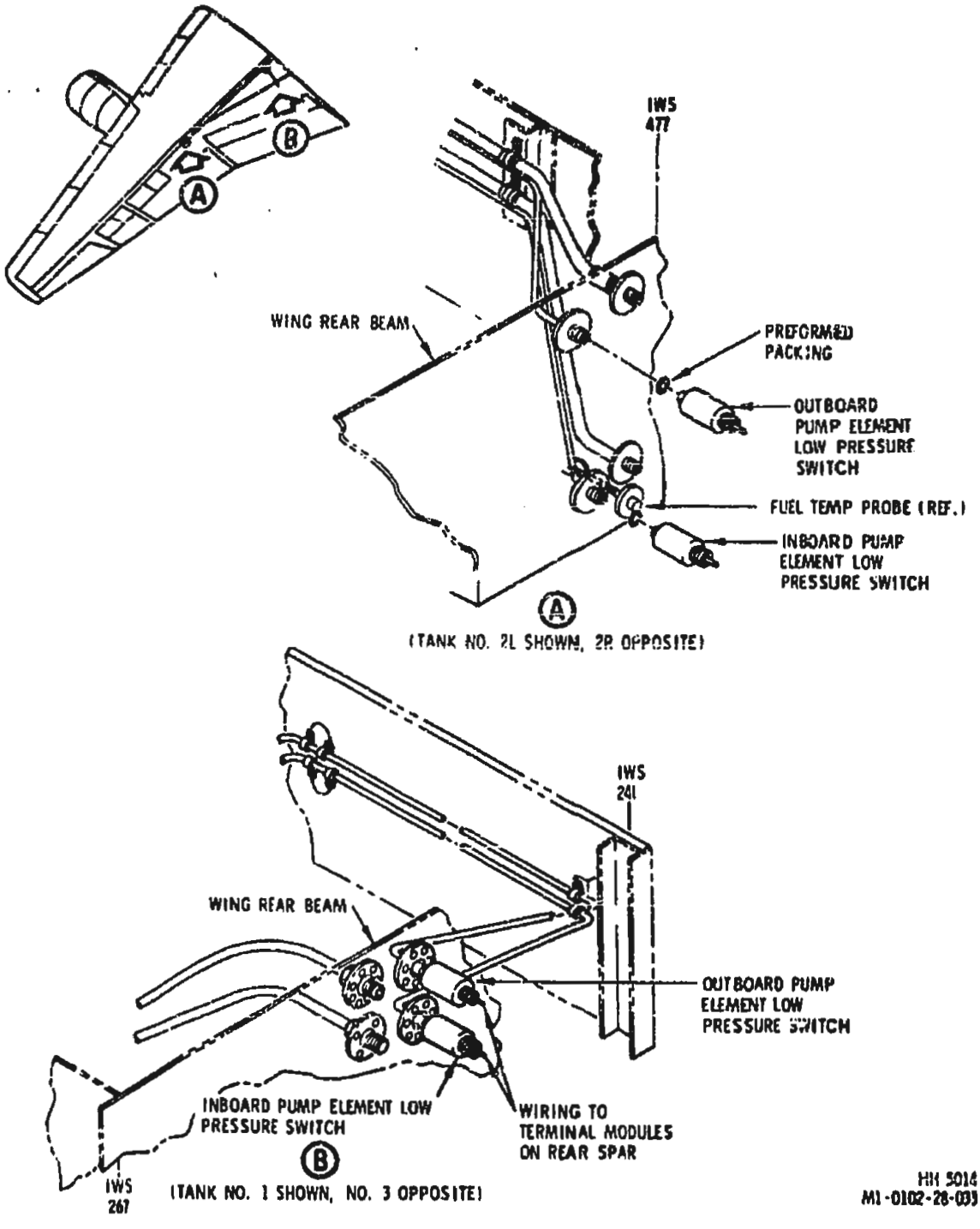
(9) Remove tag and close boost pump circuit breaker opened in Step 4A(1). Verify that switchlight LOW light goes out.

(10) Inspect for leakage at fuel pressure switch.

(11) Release switchlight.

(12) Turn off electrical power (Ref. 24-41-00).

(13) Reinstall access panel removed in Step 4A(2).



R Boost Pump Low Press Switch - Removal and Installation
R Figure 401

R EFFECTIVITY: ALL
R
001B